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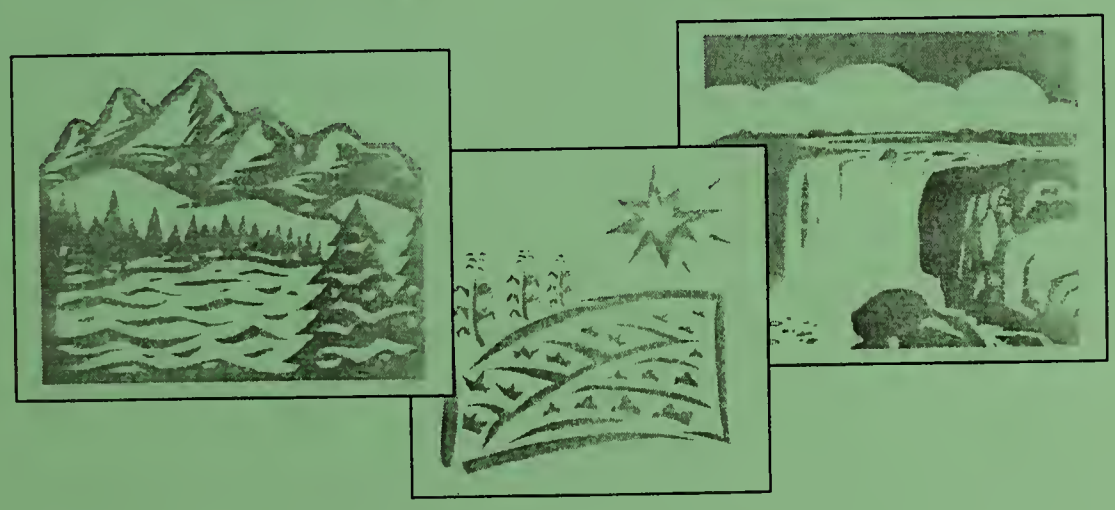
DEPARTMENT OF ENVIRONMENTAL PROTECTION

HUDSON RIVER BASIN
1997 WATER QUALITY ASSESSMENT REPORT



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HUDSON RIVER BASIN

1997 WATER QUALITY ASSESSMENT REPORT

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Report Number:

11/12/13-AC-1

DWM Control Number:

15.0

Massachusetts Department of Environmental Protection
Division of Watershed Management
Worcester, Massachusetts

January 2000

ACKNOWLEDGEMENTS

Coordination of local, state and federal agencies and private organizations is fundamental to the success of the Massachusetts Watershed Initiative. We would like to thank Thomas O'Brien, EOEA Hudson River Watershed Team Leader and the entire Hudson River Watershed Team. The Hoosic River Watershed Association (HOORWA), the Environmental Protection Agency (EPA) New England Regional Laboratory, and the Massachusetts Division of Fisheries, Wildlife and Environmental Law Enforcement (DFWELE) made significant contributions to this report.

Much appreciation is also extended to several DEP employees for their contributions: Jane Colonna-Romano, Juliet Mathers, Mark Guilmain, Tom Dallaire, Rick McVoy and Arthur Screpetis.

It is impossible to thank everyone who contributed to the assessment report process: field, laboratory, data management, writing, editing, and graphics, as well as meetings, phone calls, and many emails. These contributions are very much appreciated.

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7Q10	seven day ten year low flow
AAG	American Annuity Group, Inc.
ACEC	Areas of Critical Environmental Concern
BPJ	Best Professional Judgement
CFS	cubic feet per second
CMR	Code of Massachusetts Regulations
CNOEC	chronic no observed effect concentration
CWA	Clean Water Act
DDT	Dichlordiphenyltrichloroethane
DEM	Department of Environmental Management
DEP	Department of Environmental Protection
DFWELE	Department of Fisheries, Wildlife, and Environmental Law Enforcement
DMR	Discharge Monitoring Report
DO	Dissolved oxygen
DPH	Massachusetts Department of Public Health
DWM	Department of Watershed Management
EPA	United States Environmental Protection Agency
GIS (MassGIS)	Geographic Information System
GP	gravel packed
GPM (D)	gallons per minute (day)
JTU	Jackson turbidity unit
LC_{50}	lethal concentration to 50% of the test organisms
MDC	Metropolitan District Commission
MEPA	Massachusetts Environmental Policy Act Unit
MGD	million gallons per day
mg/L	milligram per liter
NCCW	non-contact cooling water
NH_3-N	ammonia-nitrogen
NPDES	National Pollutant Discharge Elimination System
NPS	non point source
NTU	nephelometric turbidity units
ORW	Outstanding Resource Waters
PAH	polyaromatic hydrocarbons
PALIS	Pond and Lake Information System
PCB	polychlorinated biphenols
PPM	parts per million
PWS	Public Water Supply
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/ Quality Control
RBP	Rapid Bioassessment Protocol
SARIS	Stream and River Inventory System
SEC	Sprague Electric Company
SS	suspended solids
SU	standard units
SWQS	Massachusetts Surface Water Quality Standards
TMDL	total maximum daily load
TOC	total organic carbon
TRC	total residual chlorine
USFDA	United States Food and Drug Administration
USGS	United States Geological Survey
VOC	volatile organic compound
WMA	Water Management Act
WWTP	Waste Water Treatment Plant

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EXECUTIVE SUMMARY
HUDSON RIVER BASIN 1997 WATER QUALITY ASSESSMENT REPORT

The assessment of current water quality conditions is a key step to the successful implementation of the watershed approach. This critical phase provides basic information for focusing resource protection and remediation activities to be executed later in the watershed management process. Detailed information regarding individual river and lake segments in the three subbasins (Hoosic, Kinderhook, and Bashbish) of the Hudson River Basin is presented in this assessment report. The following summary provides an overview of the status of water quality conditions in the Hudson River Basin.

HOOSIC RIVER SUBBASIN STREAMS

The *Aquatic Life Use* support status (Figure 1) of the 80.9 river miles included in this report in the Hoosic River Subbasin can be summarized as follows:

- 9.9 river miles are assessed as full support
- 29.7 river miles are assessed as partial support
- 5.4 river miles are assessed as non support
- 35.9 river miles are unassessed.

Habitat alteration impairs (non support) the *Aquatic Life Use* for a total of 4.4 river miles in the Hoosic River Subbasin. There are 3.1 miles impaired by the flood control structures (channelization) along the mainstem Hoosic River and 1.3 miles along the North Branch Hoosic River. The *Aquatic Life Use* in the mainstem Hoosic River downstream from the flood control chutes in Adams and excluding the channelized reach in North Adams is assessed as partial support. This assessment is based primarily on the benthic macroinvertebrate analysis. Although the causes and sources of impairment are unknown, elevated levels of some contaminants (PCBs, PAHs, TOC, metals including Cu, Pb, Ni, Zn, and organochlorine pesticides) were detected in sediment samples. Potential sources include urban runoff, municipal and industrial point source discharges. In the upper reach of the Hoosic River, there are concerns related to water withdrawal and increased stream temperature. Here the *Aquatic Life Use* is not assessed. The West Branch Green River and the Green River (with the exception of its lower mile) were also assessed as partial support for the *Aquatic Life Use*. The lower mile of the Green River was assessed as non support and although the cause(s) of impairment was unknown, organic enrichment and nutrients are thought to be problematic. Sources of these stressors may include failing septic systems, agricultural activities, and urban runoff.

The *Fish Consumption Use* support status (Figure 2) of the 80.9 river miles included in this report in the Hoosic River Subbasin can be summarized as follows:

- 8.1 river miles are assessed as non support
- 72.8 river miles are unassessed.

PCB contamination is present in the Hoosic River mainstem downstream of its confluence with the North Branch Hoosic River. The contamination is related to the Sprague Electric Company (SEC) site on the mainstem. PCB cleanup activities have also begun at the Beaver Mill site on the North Branch Hoosic River. Remediation is ongoing at these two sites under the direction of DEP's Bureau of Waste Site Cleanup. PCBs, however, have been detected in fish tissue (and other biota) at unacceptable levels for human consumption. The DPH has issued a fish consumption advisory against eating all fish caught from the Hoosic River below the flood control structures in North Adams (Figure 2) to the state line.

A careful review of the PCB (sediment and tissue) datasets is necessary to fully evaluate potential sources within the Hoosic River Subbasin. For example, there appears to be a source of PCBs to the Hoosic River between Hodges Cross Road and Haskins Park in North Adams, however some of the data are still preliminary. Differences in study design, sampling protocols, analytical methods, and reporting units make it difficult to compare the results of the PCB investigations. Furthermore, remediation activities are ongoing and therefore PCB levels in the environment are changing over time. A detailed PCB sampling plan for the Hoosic River Subbasin (inclusive of the hazardous waste site cleanup

activities) must be established and implemented to carefully fill in information gaps and standardize methods and reporting units.

The *Aesthetics Use* support status (Figure 3) of the 80.9 river miles included in this report in the Hoosic River Subbasin can be summarized as follows:

- 44.4 river miles are assessed as full support
- 36.5 river miles are unassessed.

Where assessed, no impairment of the *Aesthetics Use* was identified in the Hoosic River Subbasin (Figure 3). The entire Green River system (East Branch Green River, West Branch Green River, and the mainstem) was assessed as supporting this use.

The *Primary and Secondary Contact Recreational Uses* of the 80.9 river miles included in this report in the Hoosic River Subbasin can be summarized as follows:

- 80.9 river miles unassessed.

Historically pathogens (fecal coliform bacteria) had been documented at elevated levels for some locations in the Hoosic River Basin (MA DEP 1997a, MA DEP 1998, MA DEP 1990a, MA DEP 1990b, and MA DEP 1991). Since then, however, several sources of bacteria have been addressed: Clarksburg center area has been sewered; at least one farmer has installed fences to prevent livestock from entering the Green River; and enforcement action has been taken to address failing septic systems (discharging to an unnamed tributary of the Green River) in Williamstown. Unfortunately, in the fecal coliform data sets collected by DWM in 1997 and by the Hoosic River Watershed Association in 1998, data variability was too high and the data set too limited to meet data quality objectives. Therefore neither the primary nor secondary contact recreational uses were assessed. In order to assess the status of these uses, current bacteria levels need to be determined. Due to the distance between the Hudson River Basin and the DEP's Wall Experiment Station (WES), it is extremely difficult to meet the standard holding time (6 hours) established to ensure sample/analysis integrity for bacteriological sampling. An experimental field filtration alternative method was attempted unsuccessfully. This method would have increased the sample holding time. A more appropriate way to address the holding time constraint for bacteriological analysis is to promote the development of laboratory capabilities in the western part of the state.

HOOSIC RIVER SUBBASIN LAKES

Overall use support status and trophic status of the lakes surveyed in the Hoosic River Subbasin are presented in Tables 1 and 2, respectively. It should be noted that for lakes or portions of lakes where indicators were not readily observable, their trophic status was listed as undetermined (Table 2). With this approach, the assessment of lakes in the Hoosic River Subbasin is limited to a "best case" picture (i.e., only the most obvious impairments are reported). Potentially more of the lake acreage would be listed as impaired or in a more enriched trophic status if more variables were measured and more criteria assessed. Despite the "best case" scenario that is favored by the Hoosic River Subbasin lake assessment approach, four of the seven surveyed lakes (representing 84% of the surveyed acreage) showed severe (eutrophic or hypereutrophic) symptoms of succession. Presumably additional testing of dissolved oxygen, chlorophyll, and/or nutrients would corroborate that trophic status conditions are this advanced.

Table 1 Use support summary of Hoosic River Subbasin lakes surveyed in Summer 1997 (in acres).

USE	SUPPORT (THREATENED)	PARTIAL SUPPORT	NON-SUPPORT	NOT ASSESSED
AQUATIC LIFE	0	439	0	85
FISH CONSUMPTION*	0	0	0	524
DRINKING WATER	68	0	0	0
PRIMARY CONTACT	0	60	379	85
SECONDARY CONTACT	85	60	379	0
AESTHETICS	85	60	379	0

N.B. - These results represent the most recent assessments of lakes/ponds in the Hoosic River Subbasin. These data also represent about 26% (7of 27) of the lakes/ponds in the Hoosic River Subbasin and about 76% (524 of 685) of the acreage. * Statewide fish consumption advisory (Hg) precludes the evaluation of this use.

Table 2 Trophic status summary of Hoosic River Subbasin lakes surveyed in Summer 1997.

TROPHIC STATUS	NUMBER OF LAKES	ACRES
OLIGOTROPHIC	0	0
MESOTROPHIC	0	0
EUTROPHIC	●	89
HYPEREUTROPHIC	2	350
DYSTROPHIC	0	0
UNDETERMINED	3	85
TOTAL	7	85

N.B. - These results represent the most recent assessments of lakes/ponds in the Hoosic River Subbasin. These data also represent about 26% (7 of 27) of the lakes/ponds in the Hoosic River Subbasin and about 76% (524 of 685) of the acreage.

Because the synoptic surveys conducted by DWM focus on just three criteria (macrophyte cover, transparency, and presence or absence of non-native plant species) only a few uses could be assessed. With this qualification, about 84% of the surveyed surface acreage have some degree of impairment (Table 1).

The surveys indicated that noxious aquatic plants (both native and non-native) and turbidity were the major causes of impairment for the recreational and aesthetic uses (Figure 3). The overgrowth of native plants and turbidity may reflect symptoms of lake eutrophication (a process of enrichment from excessive plant nutrients and sediments being introduced to the lakes from cultural activities), while presence of non-native plants may not. These same observations were applied to determine the distribution of lake trophic conditions in the Hoosic River Subbasin, which is skewed toward the more eutrophic categories.

The sources of impairment are largely unknown, at least based on direct knowledge. However, it can be surmised that nutrients delivered from agricultural runoff, malfunctioning sub-surface sewage disposal systems, and other non-point sources are likely to cause the increased algal or macrophyte productivity that has resulted in impairments. Impairment of the *Aquatic Life Use* in the Hoosic River Subbasin lakes was assessed using only the presence of non-native plant species since no other data for this use was collected (refer to Use Assessment Methods). This cause of impairment is not always related to the cultural eutrophication process. Since these species are introduced from other parts of the country or world, they are generally free from the natural control mechanisms (e.g., insects or diseases) that keep most native

populations in check. Without controls, populations of many non-native species can grow rapidly to out-compete native plant species. This growth habit is termed "invasive".

A species of aquatic, non-native plant, Eurasian milfoil (*Myriophyllum spicatum*) was found commonly in the headwaters of the Hoosic River. A series of lakes starting with Berkshire Pond (Lanesborough) and including the three basins of Cheshire Reservoir (Cheshire/Lanesborough) contain this highly invasive species (57% of the lakes surveyed) and are assessed as partial support for the *Aquatic Life Use* (Figure 1). Since Eurasian milfoil reproduces vegetatively via cuttings that may float downstream, it is likely that areas along the Hoosic River, which begins as the outlet from Cheshire Reservoir's northernmost basin, have become infested. A second species, curly pondweed (*Potamogeton crispus)* was only observed in the South Basin of Cheshire Reservoir. Since this species tends to be prevalent earlier in the summer it may have been missed in surveys at the downstream basins of Cheshire Reservoir. Although it tends to reproduce more by seed and winter budding, it is still likely to spread downstream as well.

Two non-native wetland species, *Lythrum Salicaria* (purple loosestrife) and *Phragmites* sp. (reed grass), were observed at the surveyed lakes. The most frequently occurring non-native wetland species was purple loosestrife. Populations of this plant are pervasive throughout the entire watershed. Its presence was recorded at more than half (57 %) of the lakes surveyed. The two non-native wetland species were co-located at one lake (Cheshire Reservoir, Middle Basin). The only non-native wetland species observed at Windsor Lake was reed grass.

RECOMMENDATIONS - LAKES

For non-native aquatic and wetland plant species that were isolated to one or a few location(s) (*Potamogeton crispus* and *Phragmites* sp.) quick action is advisable to manage these populations in order to alleviate the need for costly and potentially fruitless efforts to do so in the future. Two courses of action should be pursued concurrently. More extensive surveys during the growing season need to be conducted, particularly downstream from these recorded locations, to determine the extent of the infestation. And, "spot" treatments should be undertaken to control populations at these sites before they spread further. These treatments may be in the form of carefully hand pulling individual plants, in small areas, or selective herbicide applications in larger areas. In either case, the treatments should be undertaken prior to fruit formation and with a minimum of fragmentation of the individual plants. These cautions will minimize the spreading.

The aquatic species *Myriophyllum spicatum (*Eurasian milfoil*)* and the wetland species *Lythrum Salicaria* have become more wide-spread in the Hoosic River Subbasin lakes and wetlands. Accordingly these species will require an extensive program aimed at 1) determining the extent of the distribution, 2) reducing impairment, and 3) controlling further spreading to unaffected waterbodies. As with the isolated cases, a program to manage the more extensive plant infestations should include additional monitoring efforts to determine the extent of the problem. Plant control aspects of any plan to manage the non-native aquatic species mentioned above can select from several techniques (e.g., bottom barriers, drawdown, herbicides, etc.), each of which has advantages and disadvantages that need to be addressed for the specific site. However, methods that result in fragmentation (such as cutting or raking) should be discouraged because of the propensity for these plants to reproduce and spread vegetatively (from cuttings).

Another important component of a management plan is prevention of further spreading of these plants. Once the extent of the problem is determined and control practices are exercised, vigilant monitoring needs to be practiced to guard against infestations occurring in unaffected areas and to ensure that managed areas stay in check. A key portion of the prevention program should be posting of boat access points with signs to educate and alert lake users to the problem and responsibility of spreading these species.

Table 3 Status of Hoosic River Subbasin lakes surveyed in Summer 1997.

LAKE	LOCATION	SIZE (Acres)	TROPHIC STATE	USE ATTAINMENT (Acres)	IMPAIRMENT CAUSE(S)
Berkshire Pond	Lanesborough	22	E	Aquatic Life-P(22) 1° Contact-N(22) 2° Contact-N(22) Aesthetics-N(22)	Non-native (Ms) Noxious plants
Cheshire Reservoir (North Basin)	Cheshire/ Lanesborough	218	H	Aquatic Life-P(218) 1° Contact-P(28);N(190) 2° Contact-P(28);N(190) Aesthetics-P(28);N(190)	Non-native plants (Ms) Noxious plants Turbidity
Cheshire Reservoir (Middle Basin)	Cheshire/ Lanesborough	132	H	Aquatic Life-P(132) 1° Contact-P(32);N(100) 2° Contact-P(32);N(100) Aesthetics-P(32);N(100)	Non-native plants (Ms) Noxious plants Turbidity
Cheshire Reservoir (South Basin)	Cheshire/ Lanesborough	67	E	Aquatic Life- P(67) 1° Contact-N(67) 2° Contact-N(67) Aesthetics-N(67)	Non-native plants (Ms, Pc) Noxious plants
Mt. Williams Reservoir **	North Adams	43	U	2° Contact-F(43) Aesthetics-F(43)	None
Notch Reservoir **	North Adams	25	U	2° Contact-F(25) Aesthetics-F(25)	None
Windsor Lake	North Adams	17	U	2° Contact-F(17) Aesthetics-F(17)	None

** Indicates Class A (water supply) waterbody; all others are Class B. INFORMATION CODES: Trophic State-- O= Oligotrophic, M= Mesotrophic, E= Eutrophic, H= Hypereutrophic, U= Undetermined. Use Attainment-- N= Non support, P= Partial support, F= Support. Non-native Plants-- Ms= *Myriophyllum spicatum,* Pc= *Potamogeton crispus*.

KINDERHOOK SUBBASIN STREAMS

The *Aquatic Life Use* support status (Figure 4) in the Kinderhook Subbasin can be summarized as follows:

- 4.7 river miles are assessed as non support

The fish population in Kinderhook Creek (brook and brown trout and slimy sculpin) appeared to be healthy; however the benthic macroinvertebrate community was moderately impacted. The *Aquatic Life Use* is therefore assessed as non support (Figure 4). Although the causes and sources of impairment are unknown, the benthos appeared to be responding to upstream sources of organic enrichment. Agriculture and road runoff was the only obvious potential sources. This stream merits further investigation to identify the source(s) of pollution causing the impairment.

The *Aesthetics Use* support status (Figure 4) in the Kinderhook Subbasin can be summarized as follows:

- 4.7 miles assessed as support

Despite the presence of some filamentous algae in the stream reaches sampled, Kinderhook Creek is assessed as supporting the aesthetic use.

BASHBISH SUBBASIN STREAMS

No waterbodies were assessed in this subbasin. Water quality monitoring in this subbasin should be considered around the Catamount Ski Area in order to assess potential impacts from their water withdrawal.

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Hoosic River Subbasin
Aquatic Life Use Assessment Summary

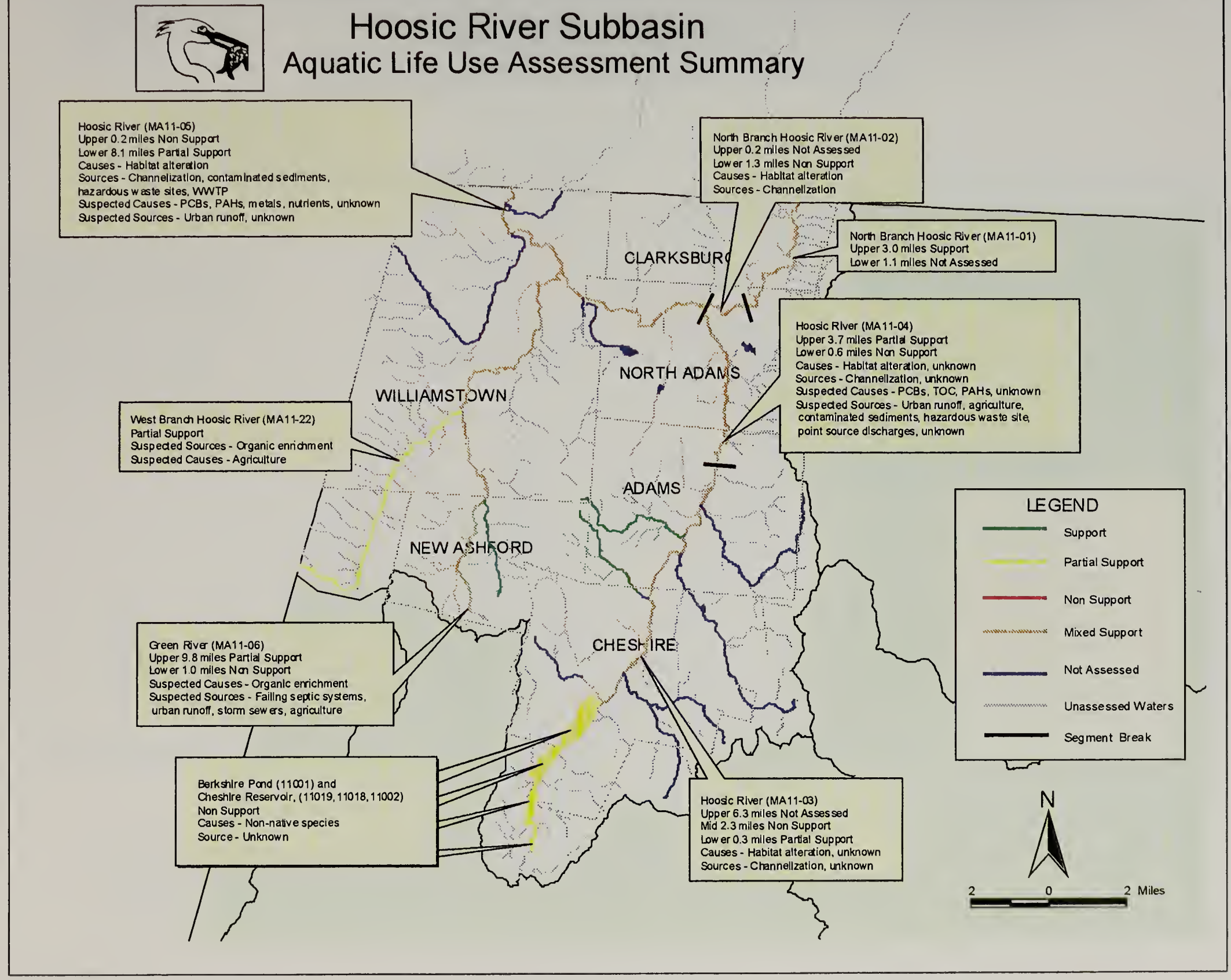
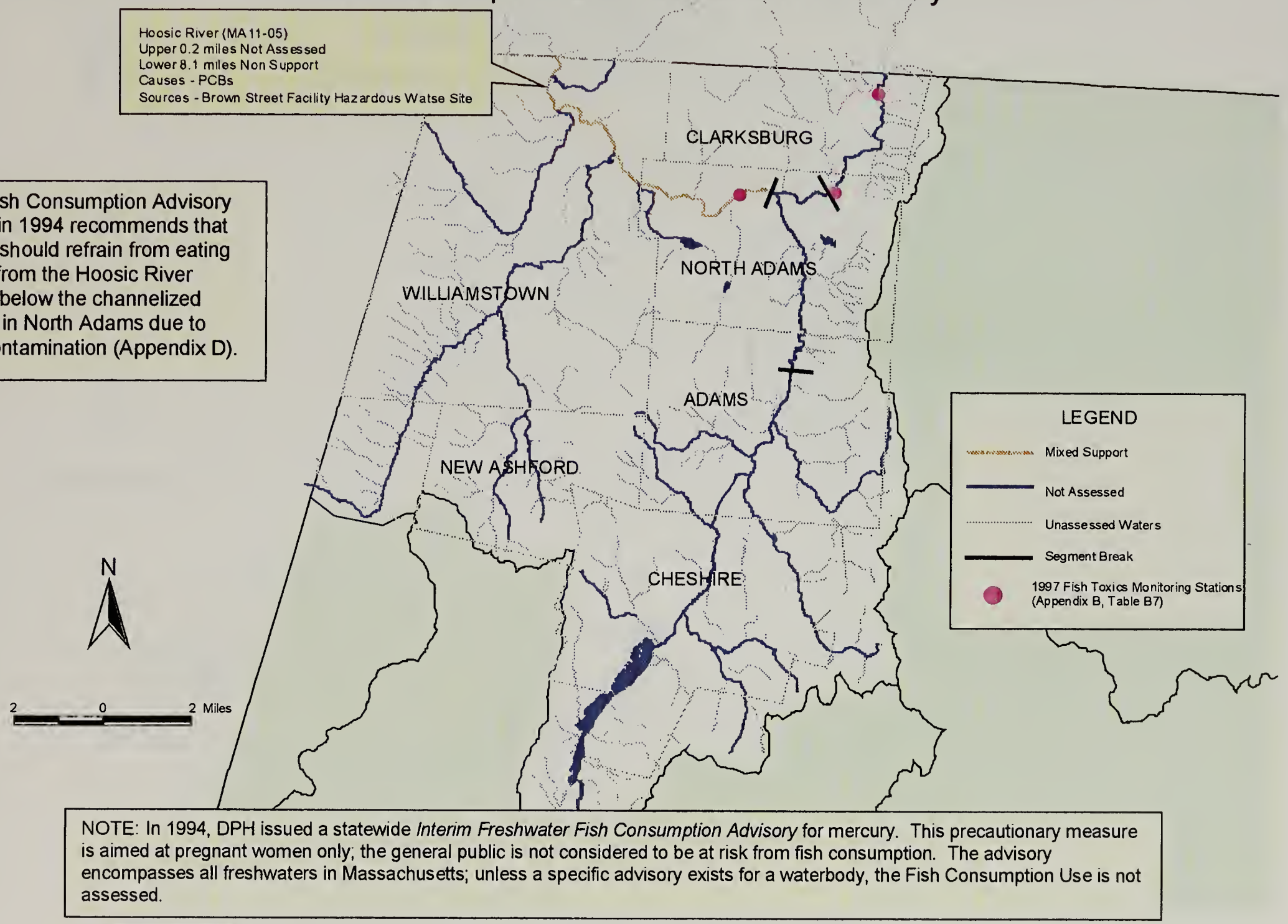


Figure 1 Hoosic River Subbasin Aquatic Life Use Assessment Summary Map.

Hoosic River Subbasin
Fish Consumption Use Assessment Summary

Hoosic River (MA11-05)
Upper 0.2 miles Not Assessed
Lower 8.1 miles Non Support
Causes - PCBs
Sources - Brown Street Facility Hazardous Watse Site

DPH Fish Consumption Advisory issued in 1994 recommends that people should refrain from eating all fish from the Hoosic River caught below the channelized section in North Adams due to PCB contamination (Appendix D).



NOTE: In 1994, DPH issued a statewide *Interim Freshwater Fish Consumption Advisory* for mercury. This precautionary measure is aimed at pregnant women only; the general public is not considered to be at risk from fish consumption. The advisory encompasses all freshwaters in Massachusetts; unless a specific advisory exists for a waterbody, the Fish Consumption Use is not assessed.

Figure 2 Hoosic River Subbasin Fish Consumption Use Assessment Summary Map.

Hoosic River Subbasin

Aesthetics Use Assessment Summary

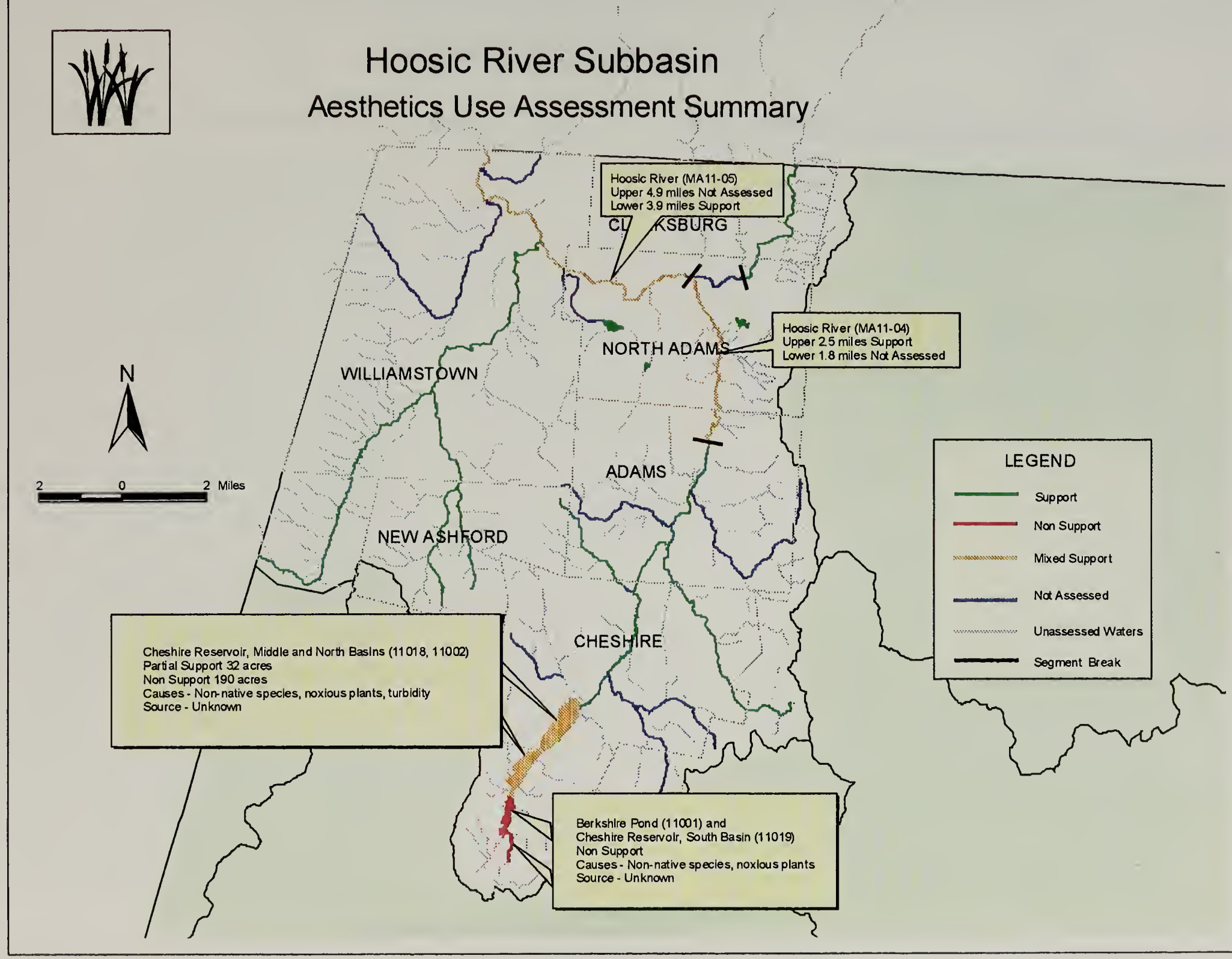
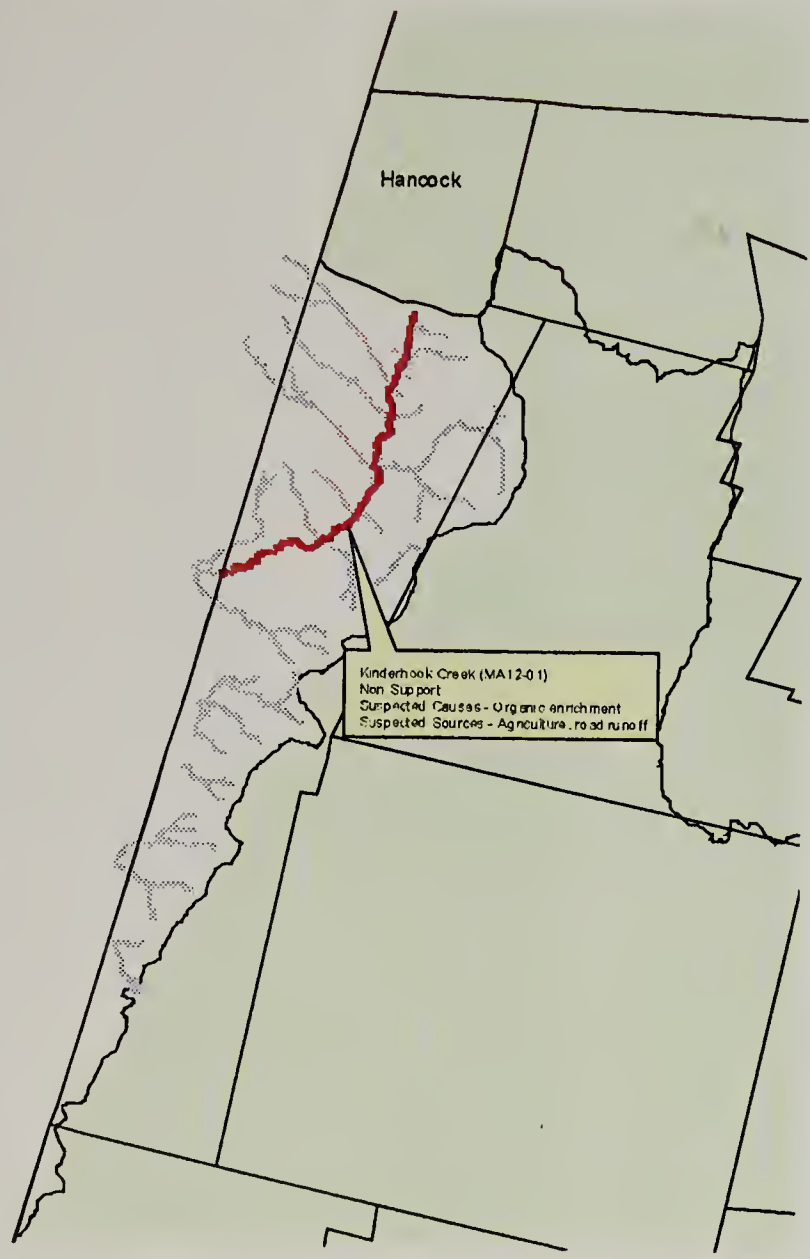


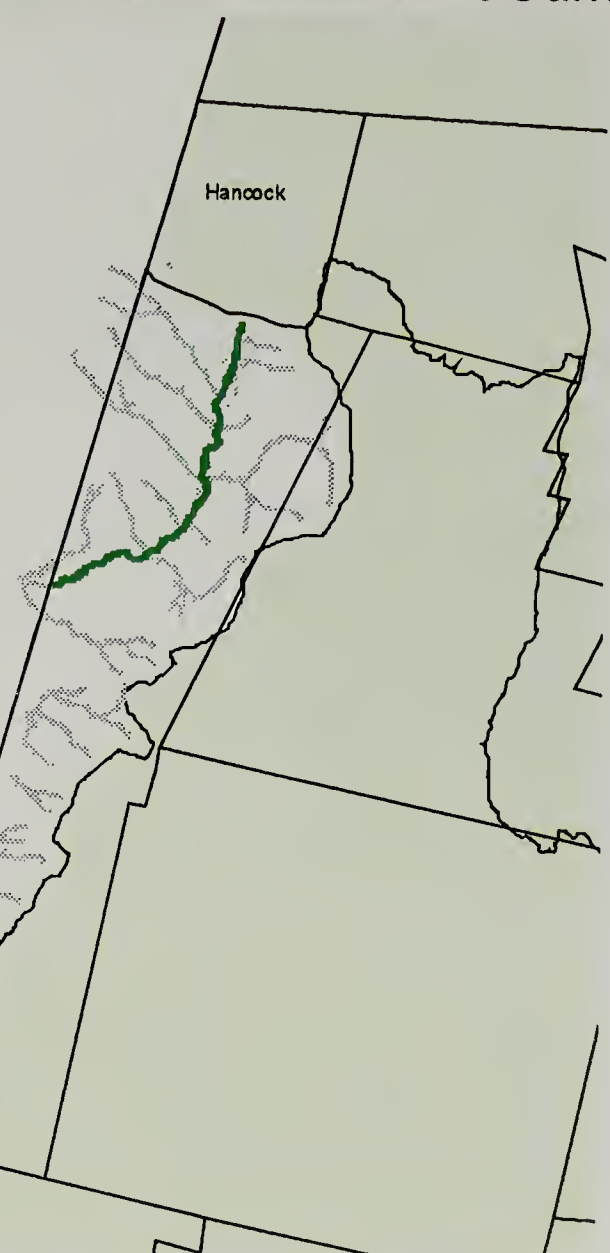
Figure 3 Hoosic River Subbasin Aesthetics Use Assessment Summary Map.

Kinderhook Subbasin

Aquatic Life Use Assessment Summary



Aesthetics Use Assessment Summary



LEGEND
- Support
- Non Support
- Unassessed Waters

N

2 0 2 4 6 Miles

Figure 4 Kinderhook Subbasin Aquatic Life and Aesthetics Use Assessment Summary Maps.

INTRODUCTION

The Massachusetts Watershed Initiative is a collaborative effort between state and federal environmental agencies, citizens, non-profit groups, businesses and industries in the watershed. The mission is to improve water quality conditions and to provide a framework under which the restoration and/or protection of the basin's natural resources can be achieved. Implementation of this project is underway in a process known as the "Watershed Approach". The five-year cycle of the Watershed Approach, as illustrated in Figure 5, provides the management structure to carry out the mission. This report presents the assessment of water quality conditions in the subbasins of the Hudson River Basin (Hoosic, Kinderhook, and Bashbish). The assessment is based on information that has been researched and developed through the first three years (information gathering, monitoring, and assessment) of the five-year cycle by the Department of Environmental Protection (DEP) as part of its federal mandate under the Federal Water Pollution Control Act (commonly known as the Clean Water Act).

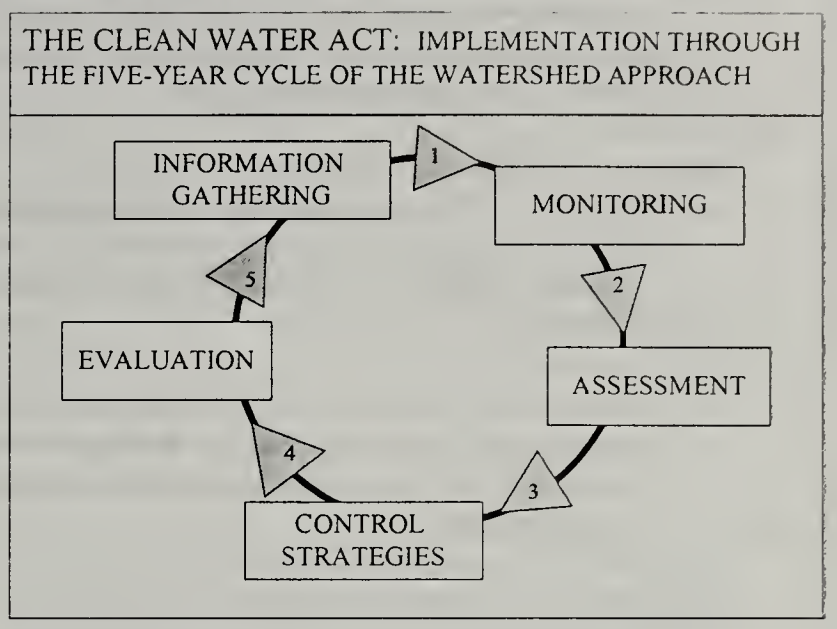


Figure 5 Clean Water Act Implementation Cycle

The objective of the Clean Water Act (CWA) is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters (Environmental Law Reporter 1988). To meet this goal, the CWA requires states to develop information on the quality of the Nation's water resources and report this information to the U.S. Environmental Protection Agency (EPA), the U.S. Congress, and the public. Together, these agencies are responsible for implementation of the CWA mandates. Under Section 305(b) of the Federal Clean Water Act, DEP must submit a statewide report every two years to the EPA, which describes the status of water quality in the Commonwealth. The 305(b) statewide report is based on the compilation of the Commonwealth's 27 watershed assessment reports. The 305(b) report compiles data from a variety of sources, and provides an evaluation of water quality, progress made towards maintaining and restoring water quality, and the extent to which problems remain. Reporting on the status of the water quality conditions follows a standardized process described in the assessment methodology. This process involves the analyzing of biological, habitat, physical/chemical, and/or toxicity data and other information to assess the degree of use support, and identify causes and sources of impairment. The following 1997 Hudson River Basin Assessment Report is an integral component of this 305(b) reporting process.

ASSESSMENT METHODOLOGY

WATER QUALITY CLASSIFICATION

The Massachusetts Surface Water Quality Standards designate the most sensitive uses for which the surface waters of the Commonwealth shall be enhanced, maintained and protected; prescribe minimum water quality criteria required to sustain the designated uses; and include provisions for the prohibition of discharges (MADEP 1996). These regulations undergo public review every three years. These surface waters are segmented and each segment is assigned to one of the six classes described below:

Inland Water Classes

1. *Class A – These waters are designated as a source of public water supply. To the extent compatible with this use they shall be an excellent habitat for fish, other aquatic life and wildlife, and suitable for primary and secondary contact recreation. These waters shall have excellent aesthetic value. These waters are designated for protection as Outstanding Resource Waters (ORW's) under 314 CMR 4.04(3).*

2. *Class B – These waters are designated as a habitat for fish, other aquatic life, and wildlife, and for primary and secondary contact recreation. Where designated they shall be suitable as a source of water supply with appropriate treatment. They shall be suitable for irrigation and other agricultural*

uses and for compatible industrial cooling and process uses. These waters shall have consistently good aesthetic value.

3. *Class C – These waters are designated as a habitat for fish, other aquatic life and wildlife, and for secondary contact recreation. These waters shall be suitable for the irrigation of crops used for consumption after cooking and for compatible industrial cooling and process uses. These waters shall have good aesthetic value.*

Coastal and Marine Classes

4. *Class SA – These waters are designated as an excellent habitat for fish, other aquatic life and wildlife and for primary and secondary recreation. In approved areas they shall be suitable for shellfish harvesting without depuration (Open Shellfishing Areas). These waters shall have excellent aesthetic value.*

5. *Class SB – These waters are designated as a habitat for fish, other aquatic life and wildlife and for primary and secondary contact recreation. In approved areas they shall be suitable for shellfish harvesting with depuration (Restricted Shellfishing Areas). These waters shall have consistently good aesthetic value.*

6. *Class SC – These waters are designated as a habitat for fish, other aquatic life, and wildlife and for secondary contact recreation. They shall also be suitable for certain industrial cooling and process uses. These waters shall have good aesthetic value.*

The CWA Section 305(b) water quality reporting process is an essential aspect of the Nation's water pollution control effort. It is the principal means by which EPA, Congress, and the public evaluate existing water quality, assess progress made in maintaining and restoring water quality, and determine the extent of remaining problems. In so doing, the States report on waterbodies within the context of meeting their designated uses (described above in each class). Each class is identified by the most sensitive, and therefore governing, water uses to be achieved and protected. These uses include: Aquatic Life, Fish Consumption, Drinking Water, Primary and Secondary Contact Recreation, Shellfishing and Aesthetics. Three subclasses of Aquatic Life are also designated in the standards: Cold Water Fishery (capable of sustaining a year-round population of cold water aquatic life such as trout), Warm Water Fishery (waters which are not capable of sustaining a year-round population of cold water aquatic life), and Marine Fishery (suitable for sustaining marine flora and fauna).

A summary of the state water quality standards (Table 4) prescribes minimum water quality criteria to sustain the designated uses. Furthermore these standards describe the hydrological conditions at which water quality criteria must be met (MA DEP 1996). In rivers and streams, the lowest flow conditions at and above which criteria must be met is the lowest mean flow for seven consecutive days to be expected once in ten years (7Q10). In artificially regulated waters, the lowest flow conditions at which criteria must be met is the flow equal or exceeded 99% of the time on a yearly basis or another equivalent flow which has been agreed upon. In coastal and marine waters and for lakes and ponds the most severe hydrological condition is determined by DEP on a case by case basis.

The availability of appropriate and reliable scientific data and technical information is fundamental to the 305(b) reporting process. It is EPA policy (EPA Order 5360.1 CHG 1) that any organization performing work for or on behalf of EPA establish a Quality System to support the development, review, approval, implementation, and assessment of data collection operations. To this end, DEP describes its Quality System in an EPA-approved Quality Management Plan (QMP) to ensure that environmental data collected or compiled by the Agency are of known and documented quality and are suitable for their intended use. For external sources of information, DEP requires the following: 1) an appropriate *Quality Assurance Project Plan* including a QA/QC plan, 2) use of a state certified lab (certified in the applicable analysis), 3) data management QA/QC be described, and 4) the information be documented in a citable report.

Table 4 Summary of Massachusetts Surface Water Quality Standards (MADEP 1996)
Note: *Italics* are direct quotations.

Dissolved Oxygen	Class A, BCWF*, SA : ≥ 6.0 mg/L and ≥ 75% saturation unless background conditions are lower Class BWWF**, SB: ≥ 5.0 mg/L and ≥ 60% saturation unless background conditions are lower Class C: Not ≤ 5.0 mg/L for more than 16 of any 24 –hour period and not ≤ 3.0 mg/L anytime unless background conditions are lower; levels cannot be lowered below 50% saturation due to a discharge Class SC: Not ≤ 5.0 mg/L for more than 16 of any 24 –hour period and not ≤ 4.0 mg/L anytime unless background conditions are lower; and 50% saturation; levels cannot be lowered below 50% saturation due to a discharge
Temperature	Class A: ≤ 68°F (20°C) and Δ 1.5°F (0.8°C) for Cold Water and ≤ 83°F (28.3°C) and Δ 1.5°F (0.8°C) for Warm Water Class BCWF: ≤ 68°F (20°C) and Δ3°F (1.7°C) due to a discharge Class BWWF: ≤ 83°F (28.3°C) and Δ3°F (1.7°C) in lakes, Δ5°F (2.8°C) in rivers Class C, SC: ≤85°F (29.4°C) nor Δ5°F (2.8°C) due to a discharge Class SA: ≤85°F (29.4°C) nor a maximum daily mean of 80°F (26.7°C) and Δ1.5°F (0.8°C) Class SB: ≤85°F (29.4°C) nor a maximum daily mean of 80°F (26.7°C) and Δ1.5°F (0.8°C) between July through September and Δ 4.0°F (2.2°C) between October through June
pH	Class A, BCWF, BWWF: 6.5 – 8.3 and Δ0.5 outside the background range. Class C: 6.5 – 9.0 and Δ1.0 outside the naturally occurring range. Class SA, SB: 6.5 – 8.5 and Δ0.2 outside the normally occurring range. Class SC: 6.5 – 9.0 and Δ0.5 outside the naturally occurring range.
Fecal Coliform Bacteria	Class A: an arithmetic mean of < 20 organisms /100 ml in any representative set of samples and < 10% of the samples > 100 organisms/100 ml. Class B: a geometric mean of < 200 organisms /100 ml in any representative set of samples and < 10% of the samples > 400 organisms /100 ml. (This criterion can be applied on a seasonal basis at the discretion of the DEP.) Class C: a geometric mean of < 1000 organisms /100ml, and < 10% of the samples > 2000 organisms/100 ml. Class SA: approved Open Shellfish Areas: a geometric mean (MPN method) of < 14 organisms/100 ml and < 10% of the samples > 43 organisms/100 ml (MPN method). Waters not designated for shellfishing: < a geometric mean of 200 organisms in any representative set of samples, and < 10% of the samples > 400 organisms /100 ml. (This criterion can be applied on a seasonal basis at the discretion of the DEP.) Class SB: approved Restricted Shellfish Areas: < a fecal coliform median or geometric mean (MPN method) of 88 organisms/100 ml and < 10% of the samples > 260 organisms /100 ml (MPN method). Waters not designated for shellfishing: < a geometric mean of 200 organisms in any representative set of samples, and < 10% of the samples > 400 organisms /100 ml. (This criterion can be applied on a seasonal basis at the discretion of the DEP.) Class SC: < a geometric mean of 1000 organisms/100 ml and < 10% of the samples > 2000 organisms/100ml.
Solids	All Classes: *These waters shall be free from floating, suspended, and settleable solids in concentrations or combinations that would impair any use assigned to each class, that would cause aesthetically objectionable conditions, or that would impair the benthic biota or degrade the chemical composition of the bottom.*
Color and Turbidity	All Classes: *These waters shall be free from color and turbidity in concentrations or combinations that are aesthetically objectionable or would impair any use.*
Oil & Grease	Class A, SA: *Waters shall be free from oil and grease, petrochemicals and other volatile or synthetic organic pollutants.* Class SA: *Waters shall be free from oil and grease and petrochemicals.* Class B, C,SB, SC: *Waters shall be free from oil and grease, petrochemicals that produce a visible film on the surface of the water, impart an oily taste to the water or an oily or other undesirable taste to the edible portions of aquatic life, coat the banks or bottom of the water course or are deleterious or become toxic to aquatic life.*
Taste and Odor	Class A, SA: *None other than of natural origin.* Class B, C,SB, SC: *None in such concentrations or combinations that are aesthetically objectionable, that would impair any use assigned to each class, or that would cause tainting or undesirable flavors in the edible portions of aquatic life.*
Aesthetics	All Classes: *All surface waters shall be free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance species of aquatic life.*
Toxic Pollutants ~	All Classes: *All surface waters shall be free from pollutants in concentrations or combinations that are toxic to humans, aquatic life or wildlife… The division shall use the recommended limit published by EPA pursuant to 33 USC 1251, 304(a) as the allowable receiving water concentrations for the affected waters unless a site-specific limit is established.*
Nutrients	*Shall not exceed the site-specific limits necessary to control accelerated or cultural eutrophication.*

*Class BCWF = Class B Cold Water Fishery, ** Class BWWF = Class B Warm Water Fishery, Δ criterion (referring to a change from ambient) is applied to the effects of a permitted discharge. ~ USEPA. 19 November 1999. Federal Register Document. [Online]. United States Environmental Protection Agency. http://www.epa.gov/fedrgstr/EPA-WATER/1998/December/Day-10/w30272.htm.

EPA provides guidelines to the States for making their use support determinations (EPA 1997). The determination of whether or not a waterbody supports each of its designated uses is a function of the type(s), quality and quantity of available current information. Each designated use within a given segment is individually assessed as 1) ***support***, 2) ***partial support***, or 3) ***non support***. The term *threatened* is used when the use is fully supported but may not support the use within two years because of adverse pollution trends or anticipated sources of pollution. When too little current data/information exists or no reliable data are available the use is ***not assessed***. However, if there is some indication that water quality impairment may exist based on any given variable, that variable is identified with an "**alert status**". Although data/information older than five years are usually considered "historical" and used for descriptive purposes, they can be utilized in the use support determination providing they are known to reflect the current conditions. While the water quality standards (Table 4) prescribe minimum water quality criteria to sustain the designated uses, numerical criteria are not available for every indicator of pollution. Best available guidance in the literature may be applied in lieu of actual numerical criteria (e.g., freshwater sediment data may be compared to *Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario* 1993 by D. Persaud, R. Jaagumagi and A. Hayton).

DESIGNATED USES

The Massachusetts Surface Water Quality Standards designate the most sensitive uses for which the surface waters of the Commonwealth shall be enhanced, maintained and protected. Each of these uses is briefly described below (MA DEP 1996):

- AQUATIC LIFE - suitable habitat for sustaining a native, naturally diverse, community of aquatic flora and fauna. Three subclasses of aquatic life are also designated in the standards for freshwater bodies; *Cold Water Fishery* - capable of sustaining a year-round population of cold water aquatic life such as trout, *Warm Water Fishery* - waters which are not capable of sustaining a year-round population of cold water aquatic life, and *Marine Fishery* - suitable for sustaining marine flora and fauna.

- FISH CONSUMPTION - pollutants shall not result in unacceptable concentrations in edible portions of marketable fish or shellfish or for the recreational use of fish, shellfish, other aquatic life or wildlife for human consumption.

- DRINKING WATER - used to denote those waters used as a source of public drinking water. They may be subject to more stringent regulation in accordance with the Massachusetts Drinking Water Regulations (310 CMR 22.00). These waters are designated for protection as Outstanding Resource Waters under 314 CMR 4.04(3).

- PRIMARY CONTACT RECREATION - suitable for any recreation or other water use in which there is prolonged and intimate contact with the water with a significant risk of ingestion of water. These include, but are not limited to, wading, swimming, diving, surfing and water skiing.

- SECONDARY CONTACT RECREATION - suitable for any recreation or other water use in which contact with the water is either incidental or accidental. These include, but are not limited to, fishing, boating and limited contact incident to shoreline activities.

- AESTHETICS - all surface waters shall be free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance species of aquatic life.

- AGRICULTURAL AND INDUSTRIAL - suitable for irrigation or other agricultural process water and for compatible industrial cooling and process water.

The guidance used to assess each designated use follows.

AQUATIC LIFE USE

This use is suitable for sustaining a native, naturally diverse, community of aquatic flora and fauna. The results of biological (and habitat), toxicological, and chemical data are integrated to assess this use. The nature, frequency, and precision of the DEP's data collection techniques dictate that a weight of evidence be used to make the assessment, with biosurvey results used as the final arbiter of borderline cases. The following chart provides an overview of the guidance used to assess the status (support, partial support, non support) of the aquatic life use:

Variable (# indicates reference)	***Support***—Data available clearly indicates support. Minor excursions from chemical criteria (Table 4) may be tolerated if the biosurvey results demonstrate support.	***Partial Support*** – Uncertainty about support in the chemical or toxicity testing data, or there is some minor modification of the biological community. Excursions not frequent or prolonged.	***Non Support*** – There are frequent or severe violations of chemical criteria, presence of acute toxicity, or a moderate or severe modification of the biological community.
BIOLOGY			
Rapid Bioassessment Protocol (RBP) II or III (4)	Non-Impaired	Slightly Impaired	Moderately or Severely Impaired
Fish Community (4)	BPJ*	BPJ*	BPJ*
Habitat and Flow (4)	BPJ*	BPJ*	Dry Streambed due to artificial regulation or channel alteration
Macrophytes (4)	No non-native plant species present, BPJ	Non-native plant species present, but not dominant, BPJ	Non-native plant species dominant, BPJ
Plankton/ Periphyton (4)	No algal blooms	Occasional algal blooms	Persistent algal blooms
TOXICITY TESTS			
Water Column (4)	>75% survival either 48 hr or 7-day exposure	>50 - ≤75% survival either 48 hr or 7-day exposure	≤50% survival either 48 hr or 7-day exposure
Effluent (4)	Meets permit limits	(NOTE: if limit is not met, the stream is listed as threatened for 1.0 river mile downstream from the discharge.)	
Sediment (4)	>75% survival	>50 - ≤75% survival	≤50% survival
CHEMISTRY- WATER			
DO (3, 6)	Criteria (Table 4)	Criteria exceed in 11-25% of measurements.	Criteria exceeded >25% of measurements.
pH (3, 6)	Criteria (Table 4)	Criteria exceed in 11-25% of measurements.	Criteria exceeded >25% of measurements.
Temperature (3, 6) ***	Criteria (Table 4), ***	Criteria exceed in 11-25% of measurements.	Criteria exceeded >25% of measurements.
Turbidity (4)	Δ 5 NTU due to a discharge	BPJ*	BPJ *
Suspended Solids (4)	25 mg/L max., Δ10 mg/L due to a discharge	BPJ*	BPJ*
Nutrients (3) Phosphate-P (4)	Table 4, (Site-Specific Criteria; Maintain Balanced Biocommunity, no pH/DO violations)	BPJ*	BPJ*
Toxic Pollutants (3, 6) Ammonia-N (3, 4) Chlorine (3, 6)	Criteria (Table 4) 0.254 mg/L**** NH_3-N 0.011 mg/L TRC	Criterion is exceed in ≤ 10% of samples.	Criterion is exceed in > 10% of samples.
CHEMISTRY – SEDIMENT			
Toxic Pollutants (5)	≤ L-EL*****	One pollutant between L-EL and S-EL	One pollutant ≥ S-EL
Nutrients (5)	≤ L-EL	between L-EL and S-EL	≥ S-EL
Metal Normalization to Al or Fe (4)	Enrichment Ratio ≤ 1	Enrichment Ratio >1 but ≤10	Enrichment Ratio ≥10
CHEMISTRY- EFFLUENT			
Compliance with permit limits (4)	In-compliance with all limits	NOTE: If the facility is not in compliance with their permit limits, the information is used to threaten one river mile downstream from the discharge.	
CHEMISTRY-TISSUE			
PCBs – whole fish (1)	≤500 µg/Kg wet weight	BPJ*	BPJ*
DDT (2)	≤14.0 µg/Kg wet weight	BPJ*	BPJ*
PCBs in aquatic tissue (2)	≤0.79 ng TEQ/Kg wet weight	BPJ*	BPJ*

*BPJ = Best Professional Judgement, ***maximum daily mean temp. in a month (minimum of 6 measurements evenly distributed over 24-hours) <criterion, ****Ammonia levels for pH of 9.0, actual "criterion" varies with pH and is evaluated case-by-case, *****L-EL = Low Effect Level and S-EL = Severe Effect Level

FISH CONSUMPTION USE

Pollutants shall not result in unacceptable concentrations in edible portions of marketable fish or shellfish or for the recreational use of fish, shellfish, other aquatic life or wildlife for human consumption. This assessment is made using the most recent list of Fish Consumption Advisories issued by the Massachusetts Executive Office of Health and Human Services, Department of Public Health (DPH), Bureau of Environmental Health Assessment Fish Consumption Advisory List. Following is an overview of the guidance used to assess the status (support, partial support, non support) of the fish consumption use.

Variable (# indicates reference)	***Support*** —No restrictions or bans in effect	***Partial Support*** – A "restricted consumption" fish advisory is in effect for the general population or a sub-population that could be at potentially greater risk (e.g., pregnant women, and children	***Non Support*** – A "no consumption" advisory or ban in effect for the general population or a sub-population for one or more fish species; or there is a commercial fishing ban in effect
DPH Fish Consumption Advisory List (8)	Not applicable, precluded by statewide advisory (Hg)	Not applicable	Waterbody on DPH Fish Consumption Advisory List

* NOTE: In 1994, DPH issued a statewide *Interim Freshwater Fish Consumption Advisory* for mercury. This precautionary measure was aimed at pregnant women only; the general public was not considered to be at risk from fish consumption. The advisory encompasses all freshwaters in Massachusetts therefore the *fish consumption use* will no longer be assessed as support.

DRINKING WATER USE

The Drinking Water Use denotes those waters used as a source of public drinking water. These waters may be subject to more stringent regulation in accordance with the Massachusetts Drinking Water Regulations (310 CMR 22.00). They are designated for protection as Outstanding Resource Waters in 314 CMR 4.04(3). This use is assessed by DEP's Drinking Water Program (DWP). The use is not assessed when the source has been placed on "emergency or backup" status since no testing is required. Below is an overview of the guidance used to assess the status (support, partial support, non support) of the drinking water use.

Variable (# indicates reference)	***Support***-- No closures or advisories (no contaminants with confirmed exceedences of MCLs, conventional treatment is adequate to maintain the supply).	***Partial Support*** – Is one or more advisories or more than conventional treatment is required	***Non Support*** – One or more contamination-based closures of the water supply
Drinking Water Program (DWP) Evaluation	Reported by DWP	Reported by DWP	Reported by DWP

PRIMARY CONTACT RECREATIONAL USE

This use is suitable for any recreational or other water use in which there is prolonged and intimate contact with the water with a significant risk of ingestion of water (1 April to 15 October). These include, but are not limited to, wading, swimming, diving, surfing and water skiing. The chart below provides an overview of the guidance used to assess the status (support, partial support, non support) of the primary contact use.

Variable (# indicates reference)	***Support***-- Criteria are met, no aesthetic conditions that preclude the use	***Partial Support*** –Criteria exceeded intermittently (neither frequent nor prolonged), marginal aesthetic violations	***Non Support*** –Frequent or prolonged violations of criteria, formal bathing area closures, or severe aesthetic conditions that preclude the use
Fecal Coliform Bacteria (3, 9) *	Criteria met (Table 4) OR Dry Weather Guidance <5 samples--≤400/100 ml maximum Wet Weather Guidance Dry weather samples meet and wet samples ≤2000/100 ml	Guidance exceeded in 11-25% of the samples OR Wet Weather Dry weather samples meet and wet samples ≥2000/100 ml	Guidance exceeded in > 25% of the samples
pH (3, 6)	Criteria (Table 4) exceeded in ≤10 % of the measurements	Criteria exceeded in 11-25% of the measurements	Criteria exceeded in >25% of the measurements
Temperature (3)	Criteria met (Table 4)	Criteria exceeded 11-25% of the time	Criteria exceeded 25% of the time
Color and Turbidity (3, 6)	Δ 5 NTU (due to a discharge) exceeded in <10 % of the measurements	Guidance exceeded in 11-25% of the measurements	Guidance exceeded in >25% of the measurements
Secchi disk depth (10) **	Lakes - ≥1.2 meters (≥ 4')	Infrequent excursions from the guidance	Frequent and/or prolonged excursions from the guidance
Oil & Grease (3)	Criteria met (Table 4)	Criteria exceeded 11-25% of the time	Criteria exceeded >25% of the time
Aesthetics (3) Biocommunity (4)**	No nuisance organisms that render the water aesthetically objectionable or unusable; Lakes – cover of macrophytes < 50% of lake area at maximum extent of growth.	Lakes – cover of macrophytes 50-75% of lake area at their maximum extent of growth.	Lakes – cover of macrophytes >75% of lake area at their maximum extent of growth.

Note: Excursions from criteria due to natural conditions are not considered impairment of use.

* Fecal Coliform bacteria interpretations require additional information in order to apply this use assessment guidance. Bacteria data results (fecal coliform) are interpreted according to whether they represent dry weather or wet weather (stormwater runoff) conditions. Accordingly, it is important to interpret the amount of precipitation received in the study region immediately prior to sampling and streamflow conditions.

** Lakes exhibiting impairment of the primary contact recreation use (swimmable) because of macrophyte cover and/or transparency (Secchi disk depth) are assessed as either *partial* or *non support*. If no fecal coliform bacteria data are available and the lake (entirely or in part) met the transparency (Secchi disk depth) and aesthetics guidance this use is *not assessed*.

SECONDARY CONTACT RECREATIONAL USE

This use is suitable for any recreation or other water use in which contact with the water is either incidental or accidental. These include, but are not limited to, fishing, boating and limited contact incident to shoreline activities. Following is an overview of the guidance used to assess the status (support, partial support, non support) of the secondary contact use.

Variable (# indicates reference)	***Support***-- Criteria are met, no aesthetic conditions that preclude the use	***Partial Support*** –Criteria exceeded intermittently (neither frequent nor prolonged), marginal aesthetic violations	***Non Support*** –Frequent or prolonged violations of criteria, or severe aesthetic conditions that preclude the use
Fecal Coliform Bacteria (4) *	Dry Weather Guidance <5 samples--≤2000/100 ml maximum >5 samples--≤1000/100 ml geometric mean ≤ 10% samples ≥2000/100 ml Wet Weather Guidance Dry weather samples meet and wet samples ≤4000/100 ml	Wet Weather Guidance Dry weather samples meet and wet samples ≥4000/100 ml	Criteria exceeded in dry weather
Oil & Grease (3)	Criteria met (Table 4)	Criteria exceeded 11-25% of the time	Criteria exceeded >25% of the time
Aesthetics (3) Biocommunity (4) **	No nuisance organisms that render the water aesthetically objectionable or unusable; Lakes – cover of macrophytes < 50% of lake area at their maximum extent of growth.	Macrophyte cover is between 50 – 75%	Macrophyte cover exceeds 75% of the lake area.

Note: Excursions from criteria due to natural conditions are not considered impairment of use.

* Fecal Coliform bacteria interpretations require additional information in order to apply this use assessment guidance. Bacteria data results (fecal coliform) are interpreted according to whether they represent dry weather or wet weather (stormwater runoff) conditions. Accordingly it is important to interpret the amount of precipitation received in the subject region immediately prior to sampling and streamflow conditions.

** In lakes if no fecal coliform data are available, macrophyte cover is the only criterion used to assess the secondary contact recreational use.

For the Primary and Secondary Contact Recreational uses the following steps are taken to interpret the fecal coliform bacteria results:

1. Identify the range of fecal coliform bacteria results,
2. Calculate the geometric mean (monthly, seasonally, or on dataset), (Note: the geometric mean is only calculated on datasets with >5 samples collected within a 30 day period.)
3. Calculate the % of sample results exceeding 400 cfu/100 mls,
4. Determine if the samples were collected during wet or dry weather conditions (review precipitation and streamflow data),
   Dry weather can be defined as: No/trace antecedent (to the sampling event) precipitation that causes more than a slight increase in stream flow.
   Wet weather can be defined as: Precipitation antecedent to the sampling event that results in a marked increase in stream flow.
5. Apply the following to interpret dry weather data:
   ≤10% of the samples exceed criteria (step 2 and 3, above) assessed as Support,
   11-25% of the samples exceed criteria (step 2 and 3, above) assessed as Partial Support,
   >25% of the samples exceed criteria (step 2 and 3, above) assessed as Non Support.

AESTHETICS USE

All surface waters shall be free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance species of aquatic life. The aesthetic use is closely tied to the public health aspects of the recreational uses (swimming and boating). Below is an overview of the guidance used to assess the status (support, partial support, non support) of the aesthetics use.

Variable (# indicates reference)	*Support*— 1.No objectionable bottom deposits, floating debris, scum, or nuisances; 2. objectionable odor, color, taste or turbidity, or nuisance aquatic life	*Partial Support* – Objectionable conditions neither frequent nor prolonged	*Non Support* – Objectionable conditions frequent and/or prolonged
Aesthetics (3)* Visual observation (4)	Criteria met (Table 4)	BPJ (spatial and temporal extent of degradation)	BPJ (extent of spatial and temporal degradation

For lakes, the aesthetic use category is generally assessed at the same level of impairment as the more severely impaired recreational use category (primary or secondary contact). **NOTE**: There are four segments in the Hoosic River Subbasin that have been encased in concrete. Although these concrete chutes are not appealing, the impairment is associated with habitat quality degradation which affects the aquatic life use not the aesthetics use. The aesthetics use assessment is based guidance relating to objectionable deposits (e.g., sludge), floating debris (e.g., algal mats), objectionable odor (e.g., sewage) or nuisances (e.g., tubifex worms). Concrete channels do not fit into any of these categories and therefore can not be used to assess the aesthetics use.

SHELLFISHING USE

This use is assessed using information from the Department of Fisheries, Wildlife and Environmental Law Enforcement's Division of Marine Fisheries. The information is in the form of various classifications of shellfish closures and restrictions. Shellfish areas under management orders are *not assessed.*

Variable (# indicates reference)	*Support* – SA Waters—open for shellfish harvesting without depuration (Open areas) SB Waters—open for shellfish harvesting with depuration (Open, conditionally approved, restricted areas)	***Partial Support*** – SA Waters—Seasonally closed/open, conditionally approved and restricted SB Waters—Seasonally closed, seasonally open, conditionally restricted areas	***Non Support*** – SA Waters—Closed areas SB Waters—Closed areas
Division of Marine Fisheries Shellfish Project Classification Area Information (11)	Reported by DMF	Reported by DMF	Reported by DMF

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HUDSON RIVER BASIN DESCRIPTION AND CLASSIFICATION

Three river basins along the western border of Massachusetts, the Hoosic, Kinderhook and Bashbish, flow into the larger Hudson River Basin (Figure 6). The Hoosic River drains approximately 165 square miles in Massachusetts all located within Berkshire County. The communities of Cheshire, Adams, North Adams, Clarksburg, New Ashford, and Williamstown lie almost entirely within the basin boundaries. Hancock, Lanesborough, Pittsfield, Dalton, Windsor, Savoy and Florida also have a small portion of their land area within the Hoosic River Subbasin. The Kinderhook Subbasin, bordered by NY State on the west, the Hoosic River Subbasin to the north and the Housatonic Basin on the southeast, drains approximately 22 square miles in MA. The drainage area includes portions of Hancock, Lanesborough, and Richmond. This area drains west into the Hudson River in NY State. The Bashbish Subbasin is located in the southwest corner of MA draining 15 square miles of Egremont and Mount Washington. The flow from Bashbish Brook also drains west into NY State and eventually into the Hudson River.

[Note: From its origin at the outlet of Cheshire Reservoir to its confluence with the North Branch Hoosic River, the Hoosic River is locally known as the South Branch Hoosic River, however it is referred to as the Hoosic River in this report.]

Consistent with the National Goal Uses of "fishable and swimmable waters", the classification of waters in the Hudson River Basin (including Hoosic, Kinderhook, and Bashbish Subbasins) according to the SWQS, include the following (MA DEP 1996):

"Class A – These waters are designated as a source of public water supply. To the extent compatible with its use they shall be an excellent habitat for fish, other aquatic life and wildlife, and suitable for

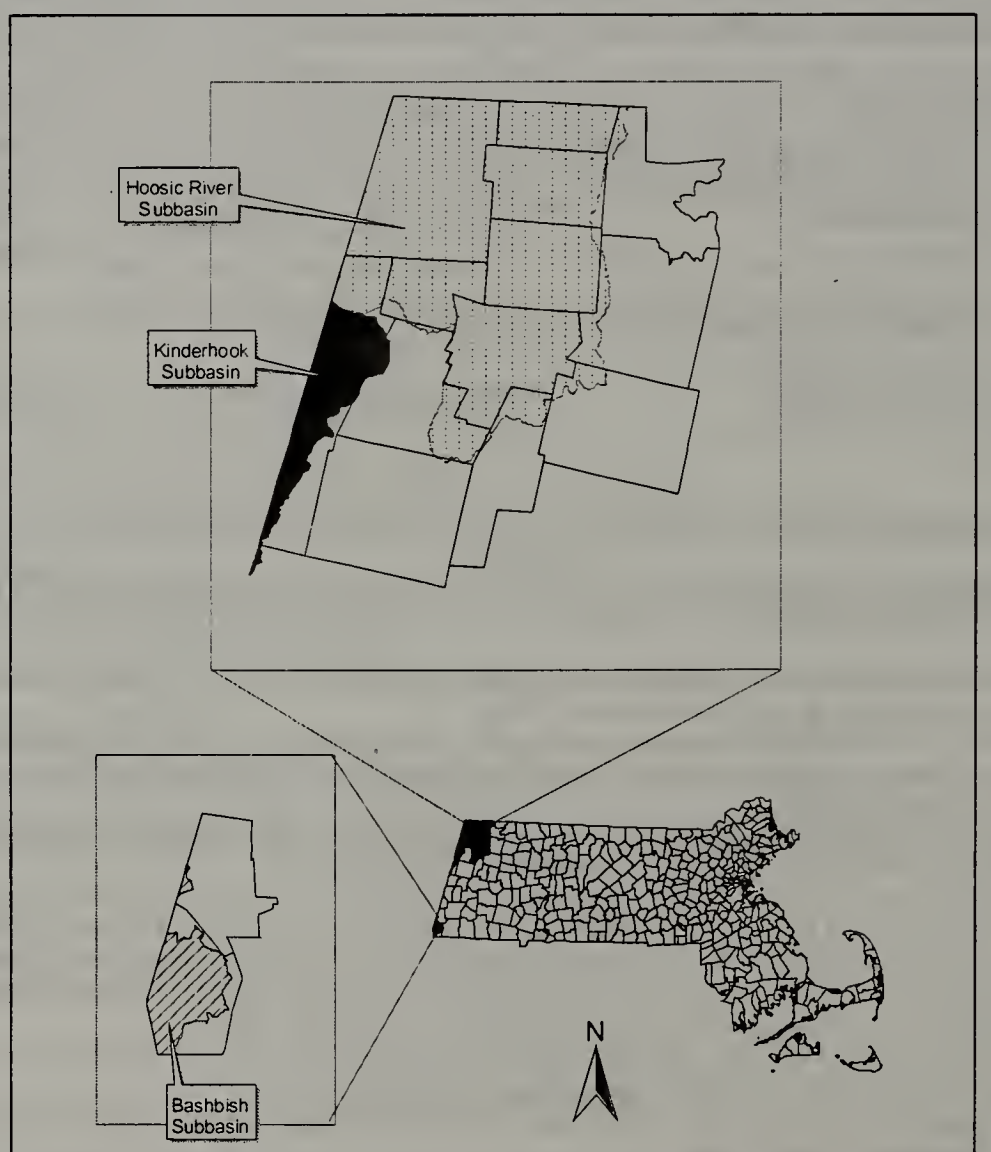


Figure 6 Hudson River Basin and Subbasins (Hoosic River, Kinderhook, and Bashbish) Locations.

primary and secondary contact recreation.

These waters shall have excellent aesthetic value. These waters are designated for protection as Outstanding Resource Waters (ORW's) under 314 CMR 4.04(3)."

The designation of ORW is applied to those waters with exceptional socio-economic, recreational, ecological and/or aesthetic values. ORWs have more stringent requirements than other waters because the existing use is so exceptional or the perceived risk of harm is such that no lowering of water quality is permissible. ORWs include certified vernal pools and all designated *Class A Public Water Supplies*, and may include surface waters found in National Parks, State Forests and Parks, Areas of Critical Environmental Concern (ACEC) and those protected by special legislation (MA DEM 1993). Wetlands that border ORWs are designated as ORWs to the boundary of the defined area. In the Hudson Basin, all designated ORWs are associated with *Class A Public Water Supplies* (Rojko *et al.* 1995).

In the Hoosic River Subbasin, the following waters are classified as A, Public Water Supply:

- Bassett Reservoir, source to outlet in Cheshire and those tributaries thereto (Bassett Brook)
- Unnamed Reservoir (Kitchen Brook Reservoir), source to outlet in Cheshire and those tributaries thereto (Kitchen Brook)
- Notch Reservoir, source to outlet in North Adams and those tributaries thereto (Notch Brook)
- Broad Brook, VT/MA State Line to the water supply intake in Williamstown (*Note: the water supply intake is actually in VT. Therefore the entire length of Broad Brook in MA should be Class B high quality water. This change will be proposed in the next revision of the SWQS.)*
- Mt. Williams Reservoir, source to outlet in North Adams and those tributaries thereto
- Williamstown Reservoir (Sherman Springs Reservoir), source to outlet to outlet in Williamstown and those tributaries thereto
- Thunder Brook, entire length and those tributaries thereto

"Class B – These waters are designated as habitat for fish, other aquatic life and wildlife, and for primary and secondary contact recreation. Where designated they shall be suitable as a source of water supply with appropriate treatment. They shall be suitable for irrigation and other agricultural uses and for compatible industrial cooling and process uses. These waters shall have consistently good aesthetic value."

In the Hudson River Basin the following waters are classified as B, Cold Water Fishery, High Quality Water:

- Hoosic River, outlet of Cheshire Reservoir to the Adams WWTP discharge
- North Branch Hoosic River, VT/MA State Line to confluence with the Hoosic River
- Kinderhook Creek, from its source to the NY State border
- Bashbish Brook, from its source to the NY State border

The following waters are classified as B, Cold Water Fishery:

- Green River, Springs Restaurant to the confluence with the Hoosic River (a.k.a., South Branch Hoosic River)

The following waters are classified as B, Warm Water Fishery:

- Hoosic River, Adams WWTP discharge to the VT/MA State Line

Unlisted waters not otherwise designated in the SWQS, are designated *Class B, High Quality Water*. Where fisheries designations are necessary they shall be made on a case-by-case basis.

OBJECTIVES

This report summarizes information generated in the Hudson River Basin through *Year 1* (information gathering in 1996) and *Year 2* (environmental monitoring in 1997) activities established in the "Five-Year Cycle" of the Watershed Initiative. Data collected by DWM in 1997, in accordance with the preliminary Quality Assurance Project Plan (QAPP) (MA DEP 1997a), are provided in Appendix A, B, C and D (QA/QC, data tables, technical memorandum of biological assessments, and fish toxics monitoring summary,

respectively). Together with other sources of information (identified in each segment assessment), the status of water quality conditions of lakes and streams in the Hudson River Basin was assessed in accordance with EPA's and DEP's use assessment methods. It is important to realize that not all waters in the Hudson River Basin have been assessed. Only those segments that have been surveyed by DEP are included in this report.

The objectives of this assessment report are to:

1. Evaluate whether or not individual segments currently meet water quality standards,
2. evaluate the status of each designated use that is applicable to the segment,
3. identify major point and nonpoint sources that could effect the segment (water withdrawals, wastewater discharges, land use practices, etc),
4. identify the presence or absence of any non-native macrophytes in lakes,
5. identify waters (or segments) of concern that require additional data to fully assess the water quality conditions, and
6. recommend additional monitoring needs and/or remediation actions in order to better determine the level of impairment or to improve/restore water quality.

SEGMENT REPORT FORMAT

The segment order in this assessment report follows the Massachusetts Stream Classification Program (Halliwell *et al.* 1982) hierarchy. Stream segments are organized hydrologically (from most upstream to downstream). Tributary summaries follow the segment into which they discharge. Lakes segment summaries are presented after the stream segments. Each segment summary is formatted as follows:

Segment identification
name, water body identification number (WBID) (Dallaire 1999a), location, length/size, classification and estimated trophic status (lakes).
Sources of information: coding system (waterbody identification number e.g., MA11-01) used by DEP to reference the stream segment in databases such as 305(b) and 303(d) (Dallaire 1999a), the Massachusetts SWQS (MA DEP 1996), and other descriptive information.

Segment description
flow direction, tributary confluences (inlets/outlets for lakes), and major land-use estimates (the top three uses for the subwatershed and 100' buffer zone)
Sources of information: descriptive information from USGS topographical maps, base geographic data from MassGIS, land use statistics from a GIS analysis using the MassGIS land use coverage developed at a scale of 1:25,000 and based on aerial photographs taken in 1985 and 1990-1992 (EOEA 1997).

Segment locator map
Subbasin map, major river location, segment origin and termination points, and segment drainage area (gray shaded)
Sources of information: MassGIS (EOEA 1997) data layers (stream/lake segments, and quadrangle maps).

Water withdrawals and wastewater discharge permit information
WMA, NPDES, and stormwater permits
Sources of information: WMA Database Printout (in MA DEP 1997a Attachment 13); open permit files located in Worcester and Springfield DEP Offices (MA DEP 1999a and 1999b); Department Environmental Management (DEM) Hudson River Basin reports (MA DEM 1989a, 1989b, and 1989c); and the draft Assessment of Land Use Activities and Nonpoint Source Pollution in the Hoosic River Watershed Report (BRPC 1998).

Use assessment
Aquatic Life, Fish Consumption, Drinking Water (where applicable), Primary Contact, Secondary Contact, and Aesthetics
Sources of information include: recent DWM survey data (Appendix B, C, D) and synoptic lake survey data (MA DEP 1997b) as well as the following: data from the DEP DWM Toxicity Testing Database "TOXTD" (Dallaire 1999b), USGS streamflow data (Socolow *et. al.* 1998, Socolow *et. al.* 1999, and USGS 1997). Any relevant historical data (> 5 years old) may also be described. The MA DPH Freshwater Fish Consumption Advisory List (MA DPH 1999) was used to determine the Fish Consumption Use. Status of the Drinking Water Use was determined for surface water supplies in the Hoosic River Basin through personal communication with DEP Drinking Water Program staff from the Springfield office (Prendergast 1999).

Summary
Use summary table (uses, status, causes and sources of impairment)

Recommendations
Additional monitoring and implementation needs

THE HOOSIC RIVER SUBBASIN

The Hoosic River Subbasin is located in the northwestern corner of Massachusetts bordering both Vermont and New York (Figure 7). Within Massachusetts, the Hoosic River Subbasin is bordered by the Deerfield River Basin to the east, the Westfield River Basin to the southeast, the Housatonic River Basin to the south and the Kinderhook Subbasin to the southwest. The Hoosic River contains areas of relatively high relief, with elevations ranging from 3,487 feet on Mount Greylock (the highest peak in MA) to approximately 560 feet at the Vermont State Line (DEM 1989a). The Hoosic River originates at the outlet of Cheshire Reservoir in Cheshire and flows north through Adams and into North Adams and is joined by the North Branch Hoosic River. *[Note: From its origin at the outlet of Cheshire Reservoir to its confluence with the North Branch Hoosic River, the Hoosic River is locally known as the South Branch Hoosic River.]* The North Branch Hoosic River enters MA in Clarksburg and flows south into North Adams after which it turns west and joins the Hoosic River. From the confluence with the North Branch, the mainstem Hoosic River flows northwest through Williamstown into southern Vermont and eventually the Hudson River in New York. The Green River, the Hoosic's largest tributary in MA joins the mainstem in Williamstown.

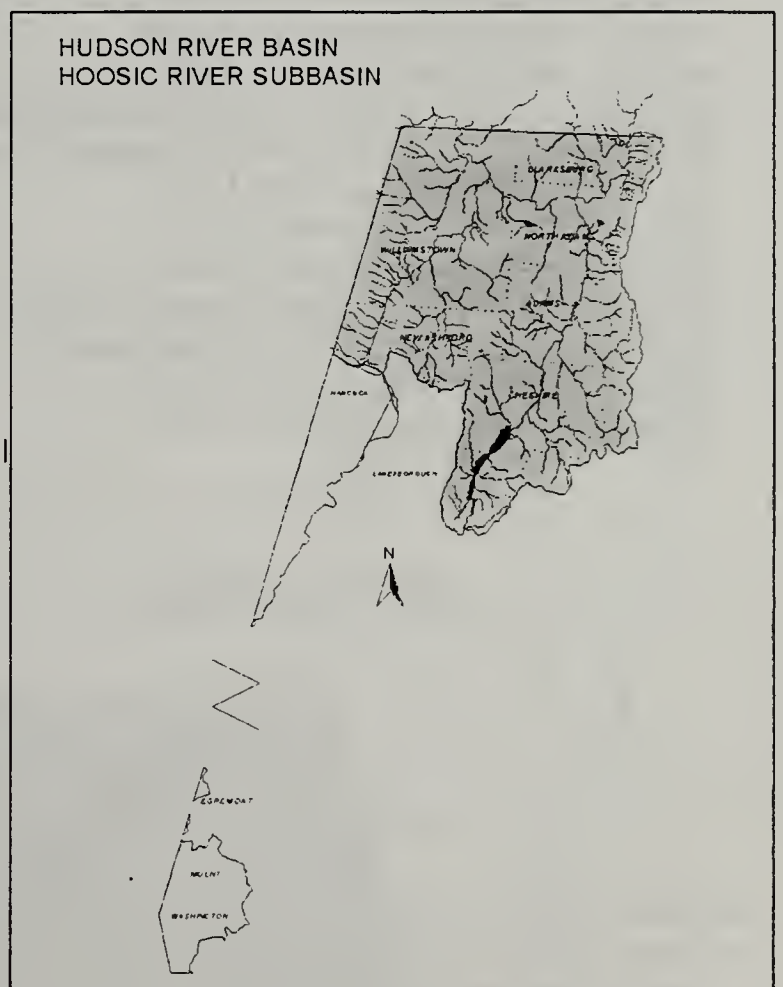


Figure 7 Hoosic River Subbasin Stream Network

Historically, industry in the Hoosic River Basin was comprised of grist and saw mills that grew around the old forts after the American Revolution. The mill industry expanded in the 1800s while large-scale agriculture did not develop due to the steep terrain. Transportation improvements (the railroad) led to further industrialization of the basin which included mining, printing, tanning and paper mills (Plotkin and Kostecki.1988).

There are a total of 47 named streams in the Hoosic River Subbasin. Segment summaries for fifteen of these streams representing 107.9 river miles are included in this report. Only seven of the streams have been assessed representing the major streams in the Hoosic River Subbasin (52.6 river miles).

In 1994 DPH updated their fish consumption advisory for the Hoosic River (Appendix D). The *Fish Consumption Use* has been changed from non support to not assessed in all but one segment of the Hoosic River based on the advisory change. The statewide DPH advisory (see Use Assessment Methods - Fish Consumption) precludes all surface waters in Massachusetts from supporting the *Fish Consumption Use*.

A total of twenty nine lakes, ponds or impoundments (the term "lakes" will hereafter be used to include all) have been identified and assigned PALIS code numbers (Pond and Lake Information System, Ackerman 1989) in the Hoosic River Subbasin. Twenty-six of the lakes are less than or equal to 50 acres in total surface area; eighteen are less than or equal to ten acres. The total surface acreage of the Hoosic River Subbasin lakes is 685.

Seven lakes were assessed in the Hoosic River Subbasin. Four of the lakes are less than 50 acres in total surface area. The lakes surveyed in 1997 are located wholly or partly within only three different communities (Cheshire, Lanesborough, and North Adams) representing 77%, or 524 acres, of the lake acreage in the Hoosic River Subbasin. Designated water supplies (i.e., Class A) accounted for only 13% (or 68 acres) of the assessed acreage.

HOOSIC RIVER SUBBASIN - RIVER SEGMENT ASSESSMENTS

The following segments in the Hoosic River Subbasin are included in this report (Figure 8):

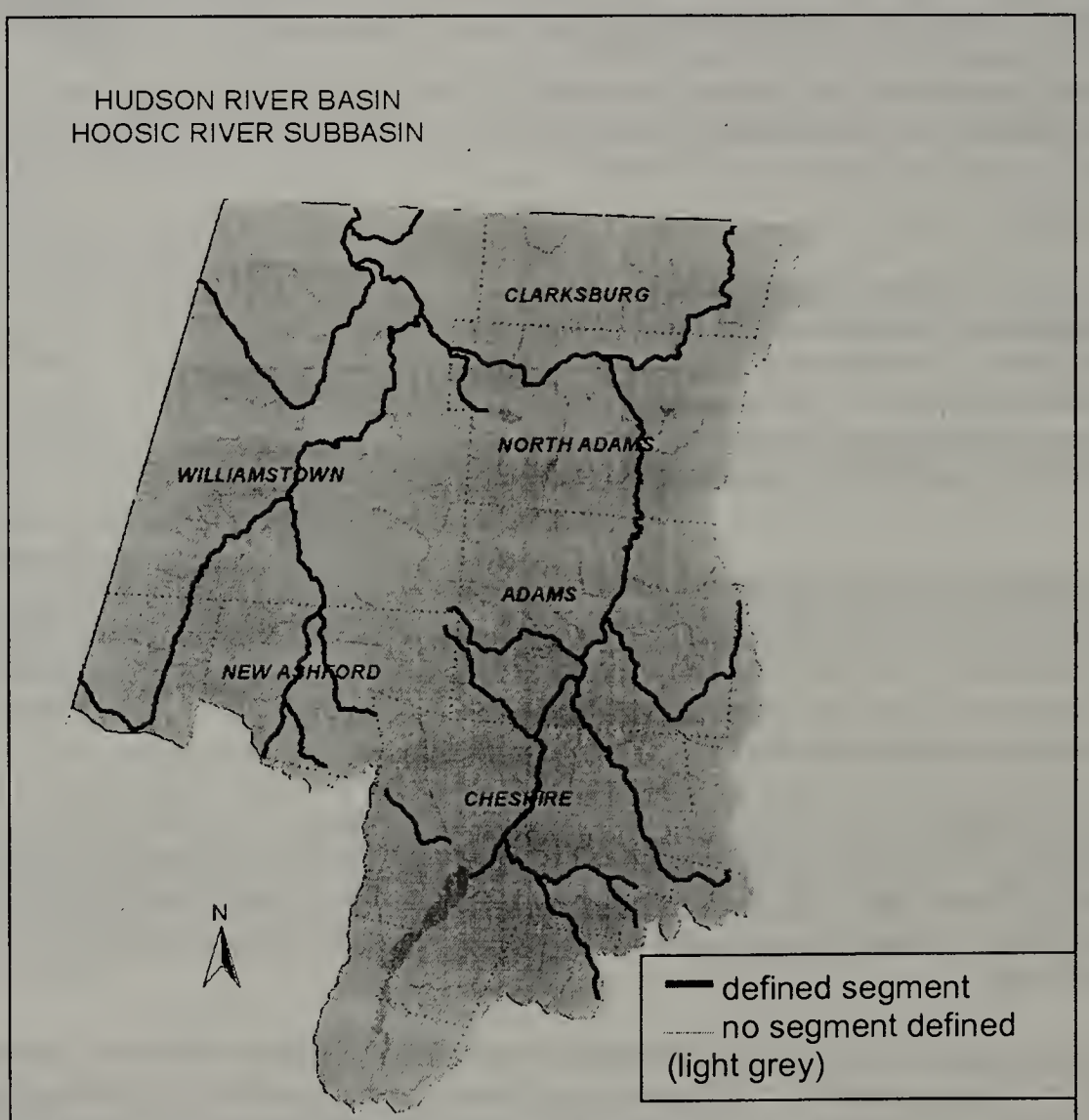


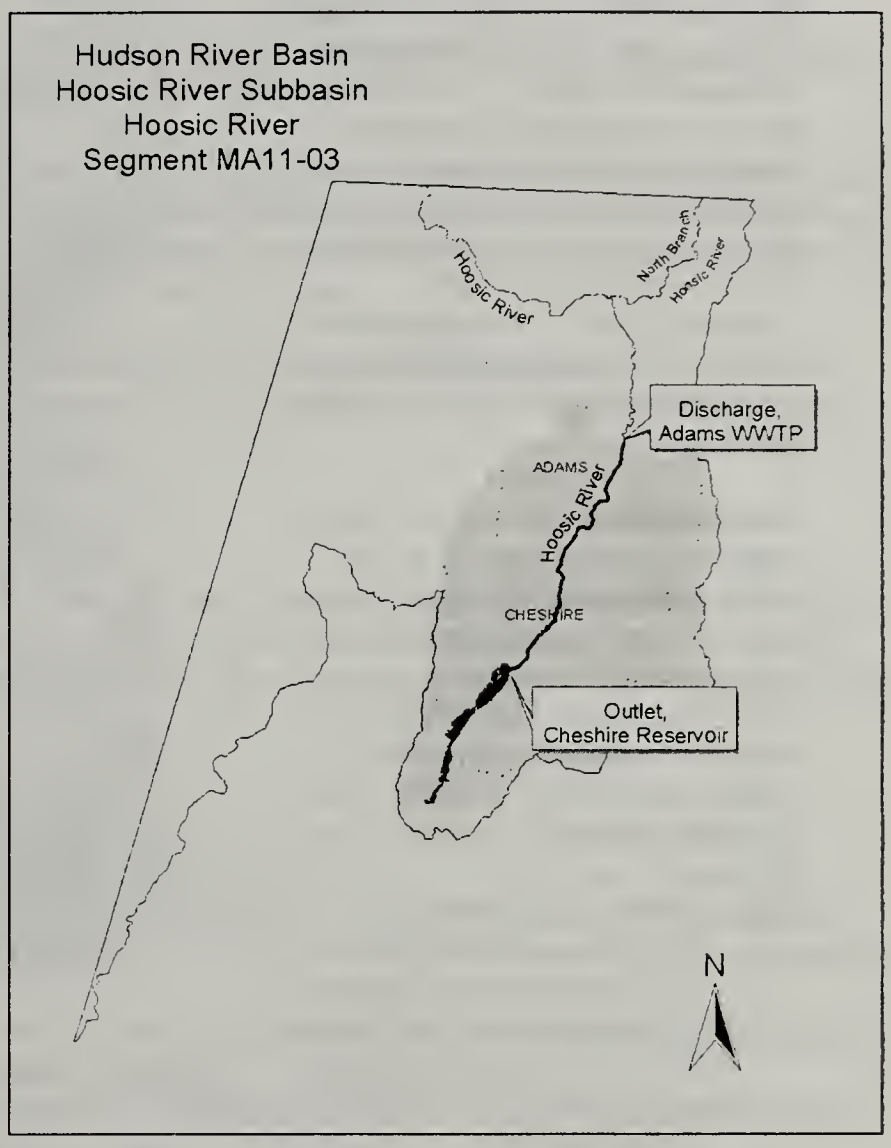
Figure 8 Hoosic River Subbasin Stream Segment Locations

HOOSIC RIVER (SEGMENT MA11-03)

Location: Outlet of Cheshire Reservoir, Cheshire to Adams WWTP discharge, Adams. Segment Length: 8.9 miles. Classification: Class B, Cold Water Fishery.

SEGMENT DESCRIPTION

This segment, the first of the mainstem Hoosic River (locally known as the South Branch Hoosic River), begins at the outlet of Cheshire Reservoir in Cheshire and ends at the Adams WWTP discharge in northern Adams. Cheshire Reservoir is made up of three separate basins (south, middle, and north). Tributaries to the Reservoir include Muddy, Gore, Pettibone and Collins brooks. Nine tributaries, including Kitchen, South, Penniman, Bassett (via an unnamed tributary), Dry, Pecks (via an unnamed tributary), Hoxie, Tophet, and Southwick brooks discharge to this segment of the Hoosic River.



The southern reach of this segment is bordered by an extensive wetland that begins approximately 1.2 miles north of the reservoir and continues for about 2 miles ending just upstream from Cheshire Harbor. The river flows northeast between Mt. Greylock (Taconic Range) to the northwest and Lenox Mountain in the Hoosac Range on the southeast. The bedrock geology in this region is generally a carbonate base with a mix of metamorphic and sedimentary forms.

Land-use is dominated by forests (71%) and by agriculture (15%). However, only 29% of the banks on both sides of the river are forested, thus identifying developed areas to be in close proximity to the river. A brief summary of these developed areas includes, beginning at the reservoir, a trailer park at the upstream end of the wetland, and two gravel pits on the west bank within 0.25 miles of the river. The river then enters Adams proper passing by a golf course on the west side and continuing through Adams' industrial center, passing by multiple discharges, and ending at the Adams WWTP discharge. A 1.6 mile stretch of the segment has been channelized and lined with concrete to reduce the impact of flooding on the city. This channel begins just north of the USGS gage 01331500 and ends at the beginning of a riprapped channel reach north of Adams proper. The riprap continues for 0.5 mile ending just north of the Lime Street Bridge (Figure 9).

Land-use estimates for the subwatershed (map inset, gray shaded area):

Forest	71%
Agriculture	15%
Residential	6%

Land-use estimates in the 100' buffer from the streambanks:

Forest	29%
Wetlands	27%
Residential	17%

WITHDRAWALS AND DISCHARGES

WMA:

1. PWS # 1058000-01G - 02G. Cheshire Water Department supplies approximately 59% of the water to the town of Cheshire. The former sources, the Kitchen Brook and Thunder Brook Reservoirs (currently backup sources) have been replaced with two ground water sources as a result of the Surface Water Treatment Rule. The two wells are located on the east-side of Route 8, approximately one mile north of the center of town.

   Cheshire Water Department had a WMA Registered volume of 0.22 million gallons per day (MGD) on the surface supplies and a permitted volume of 0.22 MGD for the new wells. The Water Department is presently using approximately 0.17 MGD according to the 1998 Annual Statistical Report.

   The sources are as follows:
   a. Well #1 is a 50 foot deep, 18 X 12 gravel packed (gp) well, with an approved safe yield of 0.396 MDG (or 275 gallons per minute--gpm) and a Zone I Protective Radius of 400 feet.
   b. Well #2, is also 50 foot deep, 18 X 12 gp well, with the identical approved safe yield and Zone I Radius. Well #2 is located 25 feet from well #1, and is used as a back up to well #1.

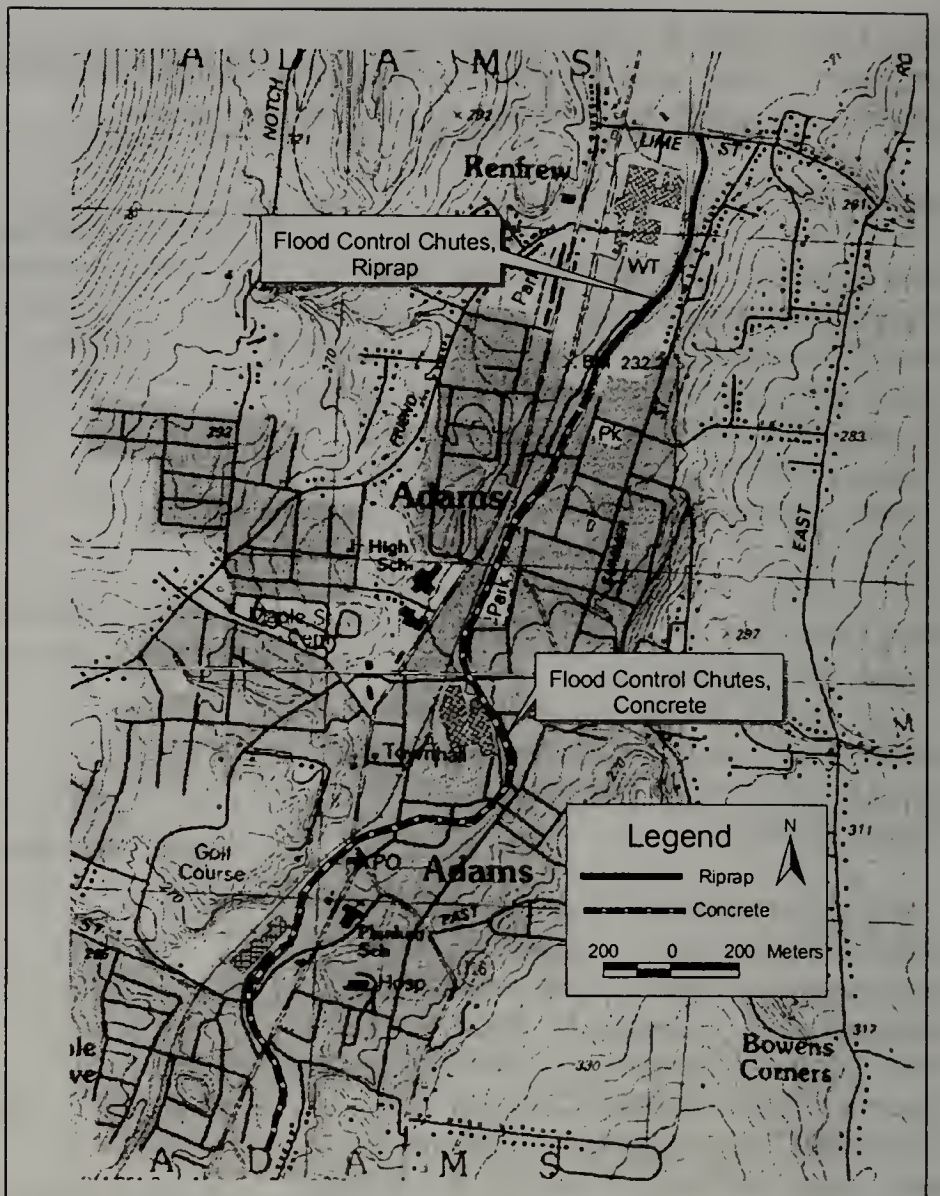


Figure 9 Hoosic River Flood Control Structures in Adams

2. PWS # 1058001-02G, 04G and 05G. Hutchinson Water Company supplies a small housing development in the southern section of Cheshire, which represents approximately 9% of the water to the town of Cheshire. Base demand in 1985-1987 was 0.03 MGD.

   Hutchinson Water Company's flows are under 0.1 MGD and therefore does not fall under the WMA Program. The Water Company is presently using approximately 0.021 MGD, according to the 1998 Annual Statistical Report.

   The sources are as follows:
   a. Well #1 - 01G, has been abandoned for approximately 20 years.
   b. Well #2 – 02G has a 6 inch diameter, 130 foot deep drilled well, which was found to have elevated levels of nitrate in 1997. The well is now available for emergency use only.
   c. Well #3 – 03G has been inactive since 1997, due to the collapse of a section of the borehole.
   d. Well #4 – 04G has a 6 inch diameter, 155 foot deep drilled well located on the western side of the development. The well uses an average of approximately 10,000 gallons per day (gpd).
   e. Well #5 – 05G is an 8 inch diameter, 300 foot deep well, drilled in 1997, to replace well #3. The well, which is now considered the main well, has an approved yield of 64,800 gpd (45 gpm).

3. PWS # 1058002 – 01G – 02G. Pine Valley Mobile Home Park supplies water to approximately 95 mobile homes in the town of Cheshire.

Pine Valley's flows are under 0.1 MGD and therefore does not fall under the WMA Program. The Mobile Home Park is presently using approximately 0.01 MGD, according to the 1998 Annual Statistical Report.

The sources are as follows:

a. Well #1 is a 123 foot deep, 6 inch diameter drilled well, with a Zone I Protective Radius of 261 feet.
b. Well #2, is also 123 foot deep, with the identical Zone I Radius.

4. PWS # 1004000-01S and 01-04G. Adams Fire District supplies approximately 94% of the water to the town of Adams. The former source, Bassett Brook Reservoir has been replaced with the existing ground water sources as a result of the Surface Water Treatment Rule. The four wells are located on the east side of Route 8, approximately one mile south of the center of town.

   Adams Fire District has a registered volume of 2.0 MGD and an additional permitted volume of 0.16 MGD for the wells. The Water Department is presently using approximately 1.4 MGD according to the 1998 Annual Statistical Report.

   The sources are as follows:

   a. Well #1 is inactive and out of service.
   b. Well #2A, is a 12 inch diameter, 87 foot deep gp well, with an approved safe yield of 0.86 MGD.
   c. Well #3, is a 12 inch diameter, 101 foot deep gp well, with an approved safe yield of 1.96 MGD.
   d. Well #4, the newest well is a 30 inch diameter, 81 foot deep gp well, with an approved safe yield of 2.3 MGD.

NPDES:

1. MAG250007 issued June 1995. Polyfibron Technologies, Inc. (Replaces MA0035301 --formerly W.R.Grace & Co. Adams. Polyfibron Technologies, Inc. acquired the Grace Polyfibron Division in December 1994). The Adams Fire District supplies water to the company. The non-contact cooling water discharge (average monthly flow of 0.1 MGD (0.16 MGD max daily) of non-contact cooling water to the Hoosic River.
2. MA0031046. Berkshire Mill Residences. No available information on this permit, see recommendations section.
3. MA0020227. Berkshire Screw Machine Products, Inc. Route 8, Cheshire. Permit issued August 1978. No available information on this permit, see recommendations section.

Stormwater Permits:

1. MAR00A095 – W.R.Grace
2. Unknown Permit Number – Berkshire Mill Residences

USE ASSESSMENT

AQUATIC LIFE

Biology

The 1997 DWM RBPIII survey was conducted just upstream of the Adams WWTP discharge (benthic station HR07U) (Appendix C). The data collected from this station were compared to the regional reference station (GE01) on the East Branch Green River. The RBPIII analysis indicated 58% comparability (slight impairment) to the reference station. This station is considered to be representative of the lower 0.3 mile length of this segment (downstream from Lime Street Bridge). Based on this analysis, the aquatic life use is assessed as partial support for the lower 0.3 mile length of this segment.

Habitat quality conditions in the Hoosic River where the concrete flood control structures/riprap streambed exist (between the USGS gage and Lime Street Bridge [BCRPC 1987 and Schlesinger 1999b]) have been adversely affected. The 2.3 mile reach therefore does not support the aquatic life use as a result of this channelization. The upper 6.3 mile length of this segment is not assessed due to the lack of current information.

In 1976 DFWELE (Project No. F-36-R-8) conducted a fish population survey in this reach of the Hoosic River. In the upper reaches of this segment, cold water species, although present, were not nearly as abundant as warm water fish (MA DEP 1997a, Attachment 1). A substantial native brown trout population was found in the reach between the Lime St Bridge and the Adams WWTP. No recent fish population work has been done in this segment of the Hoosic River.

The Hudson River Basin Plan Volumes I, II, and III (DEM 1989a, 1989b, and 1989c) determined that a 22% reduction of streamflow occurred in this segment of the Hoosic River due to public water supply withdrawals (primarily Adams Fire District). In addition to these public withdrawals, three self-supplied industrial water users are also located in Adams. The combined affect of their withdrawals, as well as anticipated increases in water use (88% for five industrial users by the year 2010), places this segment of the Hoosic River on "alert status" in terms of water quantity/quality. Streamflow measurements below the outlet of Cheshire Reservoir were not less then 10 cfs during the 1997 DWM surveys (Appendix B, Table B2).

[Currently the 7Q10 is approximately 12.63 cfs at the USGS gage #01331500 (USGS 1998). DEM recommended a minimum streamflow threshold of 0.38 cfs/mi^2 for June, July and August. At the USGS gage, where the drainage area is 46.7 mi^2 (Socolow et. *al.* 1998, Socolow et. *al.* 1999 and Wandle 1984), this would translate to 17.7 cfs.]

Toxicity

The Adams WWTP has collected and used Hoosic River water from this segment as dilution water for use in their whole effluent toxicity tests since 1992 (Dallaire 1999b). Survival of *Ceriodaphnia dubia* exposed (7-day) to the river water has ranged between 60 and 100%. Survival was less than 75% on three out of 21 testing events. Survival of *Pimephales promelas* exposed (7-day) to Hoosic River water ranged between 63 and 100% although only one out of 10 testing events was below 75% survival. Due to the recently lower survival rates of *C. dubia,* this segment is given an "alert status".

Chemistry - water

DO

Dissolved oxygen was measured at two stations by DWM (HR08A- outlet of Cheshire Reservoir and HR7A- 50 ft upstream from Lime Street Bridge) on three occasions in 1997 (Appendix B, Table B3). At the outlet of Cheshire Reservoir, DO was below 75% saturation on one occasion which raises some concern. Supersaturation (107 – 116%) was evident in the Hoosic River at the Lime Street Bridge. Due to the small data set, limited sample sites and the lack of pre-dawn oxygen readings, the dissolved oxygen dynamics are not well documented. This segment is therefore given an "alert status".

Temperature

A citizen survey was conducted from May through August 1999 at three locations in this reach of the Hoosic River (Schlesinger 1999a, 1999b, and 1999c). Temperature data loggers were deployed which recorded hourly measurements. The maximum mean monthly temperature exceeded 68°F (20°C) at all three stations between June and August 1999. Due to the limited documentation regarding sensor placement, and the lack of a QAPP, this data serves to place this segment on an "alert status".

pH

pH was measured at the same stations and dates as DO described above (Appendix B, Table B3). All pH measurements were above 8.0 SU. Similarly, Hoosic River pH measurements reported in the Adams WWTP toxicity testing reports ranged from 6.7 to 8.5 SUs. While these high values may indicate increased primary productivity, pHs in this range are also likely to be found in a carbonate-based watershed.

Turbidity

A very limited data set was collected by DWM in 1997 (Appendix B, Table B4). No problems were indicated.

Suspended Solids

SS samples were collected by DWM at the same location and dates as DO described above. None of the samples exceeded 25 mg/L (Appendix B, Table B4). Hoosic River suspended solids measurements reported in the Adams WWTP toxicity testing reports were as high as 120 mg/L,

however only two out of 20 measurements were above 25 mg/L (Dallaire 1999b). Suspended solids do not appear to impair water quality.

Ammonia-Nitrogen

NH_3-N samples were collected by DWM at the same location and dates as DO described above (Appendix B, Table B4). Levels were well below the instream water quality criteria. Similarly, Hoosic River NH_3-N measurements reported in the Adams WWTP toxicity testing reports ranged from below detection limit to 0.56mg/L, all below the instream water quality criteria (Dallaire 1999b).

Phosphorus

TP samples were collected by DWM at the same location and dates as DO described above (Appendix B, Table B4). Concentrations did not appear to be elevated.

Total Residual Chlorine

Hoosic River TRC measurements reported in the Adams WWTP toxicity testing reports (Dallaire 1999b) were generally below the minimum quantification limit (0.05 mg/L). Only one measurement (0.24 mg/L) was of concern. Although the minimum quantification limit is higher than the instream water quality criteria (0.011 mg/L), no impairment due to TRC in this reach of the Hoosic River was determined.

Chemistry – sediment

No sediment samples have recently been collected in this segment of the Hoosic River. Historical data (sediment collected in 1986 from the river near Lime Street Bridge and analyzed for metals) are available (MA DEP, 1990b). None of the metals analyzed exceeded the sediment guidance thresholds.

Chemistry – tissue

EPA collected hydropsychid caddisfly larvae in September 1998 from the Hoosic River at the Adams/Cheshire Harbor town line (Nolan 1999). Additional information and guidance are needed to utilize this information in the aquatic life use assessment.

FISH CONSUMPTION

This use is no longer assessed (see Use Assessment Methods and Appendix D).

PRIMARY CONTACT

Too little data are available to assess this use (Appendix B, Table B5).

SECONDARY CONTACT

Too little data are available to assess this use (Appendix B, Table B5).

AESTHETICS

The South Branch Stream Team Shoreline Survey identified much of this segment of the Hoosic River to have excellent habitat (Hoosic River Watershed Association 1999). This same observation was reported in the 1997 DWM habitat assessment (Appendix C), and as well by DWM field sampling staff. Although there are a few areas of the river where trash and debris were observed, potential oil and/or nutrient seep evidence within the concrete chutes, as well as localized areas of erosion, overall this use is supported. An overriding objectionable condition (concrete channel) is not an aesthetic issue according to the use assessment guidance but rather an aquatic life issue related to habitat quality.

SUMMARY

Physical alteration (flood control structures) of the streambed and banks has resulted in a reduction of habitat available for aquatic life thus impairing the aquatic life use. The benthic macroinvertebrate community in the Hoosic River just upstream of the Adams WWTP discharge is slightly impacted from unknown sources. Whether or not the Hoosic River is capable of supporting a Cold Water Fishery is unknown at this time. The status of each individual use is summarized below.

Hoosic River (MA11-03) Use Summary Table

Designated Uses		Status	Causes		Sources	
			Known	Suspected	Known	Suspected
Aquatic Life*		Upper 6.3 miles not assessed, mid 2.3 miles non support, lower 0.3 mile reach partial support	Habitat alteration	Unknown	Channelization	Unknown
Fish Consumption		not assessed				
Primary Contact		not assessed				
Secondary Contact		not assessed				
Aesthetics		8.9 miles support				

* "alert status" issues identified, details in this segment's USE ASSESSMENT section

RECOMMENDATIONS

ADDITIONAL MONITORING

To fully assess the status of each use in this segment:

- Additional benthic stations and habitat assessment is required to characterize the communities in the upper reaches of this segment, between the outlet of Cheshire Reservoir and Adams WWTP.
- Dissolved oxygen measurements need to be taken at additional sites at worse case scenario times to determine if the current conditions are frequent and prolonged and involve the entire segment.
- Increase pH sampling from Cheshire to Adams to determine if high values are related to primary productivity.
- In the section of the River encased in concrete, the stream teams identified areas of algal growth. Determine cause of algal growth and whether or not this condition merits further investigation (i.e., possible sewage seeps).
- More extensive spatial and temporal turbidity monitoring to characterize any erosional impacts from existing land use practices.
- Additional nutrient sampling throughout the segment to quantify the current conditions (phosphorus and Nitrogen series).
- Due to the small sample size and data variability, supplemental bacteria samples at sites throughout the segment on multiple dates should be collected.

To determine the viability of a Cold Water Fishery:

- Fish population surveys for the length of this segment to determine if currently the waters support populations indicative of this fishery.
- Temperature ranges need to be established for the entire stretch due to the anthropogenic influences of the discharges and concrete channels. Determine if there are any effects from the Polyfibron (noncontact cooling water) discharge on this section of the segment. Identify any temperature data available for this discharge and evaluate.

To determine the impacts of the withdrawals and discharges:

- Segment flow studies to identify any impacts caused by the various water withdrawals.
- Sample upstream/downstream of discharges.

To identify sources of impairment/ "alert status":

- Review final report or technical memorandum from EPA on their 1998 Hoosic River sediment and tissue study.
- Additional benthic sampling upstream to determine the extent of impairment.

- Conduct appropriate monitoring (habitat quality assessment) at locations identified by the South Branch Stream Team in their Shoreline Survey (Hoosic River Watershed Association 1999) where erosional areas were identified.
- Land use determination and inventory of wastewater practices.
- Establish reasons for extremes in dissolved oxygen measurements.
- Continue temperature monitoring including DEP approved methodology. Add additional sites upstream downstream of any temperature changing influence.
- Estimate percentage of stream that is shaded and stream reaches which shading could be increased.

IMPLEMENTATION

Point source

- The Polyfibron Technology NPDES permit needs to be reissued. Discharge permit limits should be calculated for a Cold Water Fishery rather than a Warm Water Fishery. The sampling frequency will also change from quarterly to monthly for flow, pH, and temperature. The original WRGrace NPDES permit indicated three outfalls (001, 002, and 003). The combined flow from these outfalls was 0.25 MGD. Determine whether or not there are any outfalls still discharging to the Hoosic River not included in the permit transfer from WRGrace to Polyfibron Technologies, Inc. Determine current water use and summarize effluent monitoring of flow, pH, and temperature quality from DMRs.
- Changes to discharge permit levels in this segment need to be in consideration of downstream permit limits and water resource quality (i.e. temperature).
- Water conservation measures should be implemented to preserve naturally occurring streamflow patterns and volumes as much as possible.
- Berkshire Screw Machine Products, Inc. Route 8, Cheshire. NPDES Permit # MA0020227 issued August 1978. Identify if this facility still exists and if so, develop draft permit for reissuance.
- Berkshire Mill Residences. Currently DEP DWM has no available information on this NPDES permit. Permit number MA0031046 was obtained from EPA. Identify status of this permit including flow and effluent monitoring.

Non point source

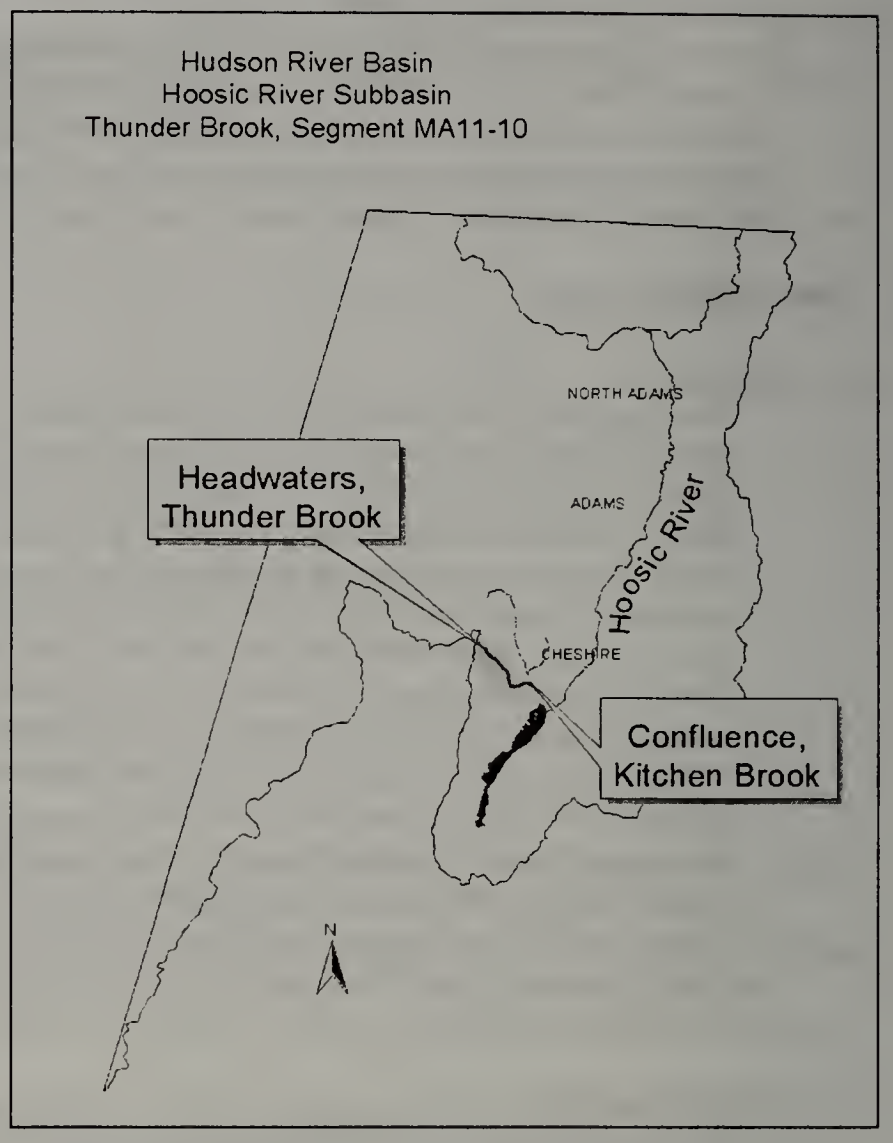
- Review information from the draft *Assessment of Land Use Activities and Nonpoint Source Pollution in the Hoosic River Watershed* (BRPC 1998). This report contains an up-to-date summary of existing and potential nonpoint sources of pollution in the Hoosic River Subbasin. Specifically, two subwatershed planning areas – "South Main Hoosic" and "Mid Main Hoosic" are relevant to this segment (MA11-03) of the Hoosic River. Determine if any problems identified in the BRPC report warrant further investigation (water quality monitoring, etc.) and/or remediation (streambank stabilization, etc).

Other

- Investigate possible ways to increase habitat for aquatic life in the sections of this segment that are impacted by the flood control chutes.

THUNDER BROOK (SEGMENT MA11-10)

Location: Source, Cheshire to confluence with Kitchen Brook, Cheshire. Segment Length: 1.9 miles.
Classification: Class A, Public Water Supply



SEGMENT DESCRIPTION

Thunder Brook, a Class A Public Water Supply, originates in the Mt. Greylock State Reservation in Cheshire. The brook flows southeast down a steep ravine and crosses under Lanesborough Mountain Road. The brook then turns east and flows into the reservoir. The brook joins Kitchen Brook a short distance downstream from the dam.

Land-use estimate for the subwatershed (map inset, gray shaded area):

Forest	77%
Agriculture	21%
Residential	2%

Land-use estimate in the 100' buffer:

Forest	82%
Agriculture	13%
Residential	4%

WITHDRAWALS AND DISCHARGES

WMA:

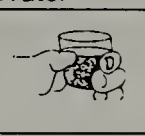
1. PWS # 1058000-02SG Cheshire Water Department supplies approximately 59% of the water to the town of Cheshire. Sources were from Kitchen and Thunder Brook Reservoirs. Registered volume (collectively) is 0.22 MGD. Both of these sources have recently been replaced (1998) by two new wells located in the high yield aquifer along the Hoosic River (in the "jungle" area). The Kitchen and Thunder Brook Reservoirs are now on standby status as emergency backup sources.

USE ASSESSMENT

Overall, no current data were available to determine if this segment meets water quality standards.

SUMMARY

All designated uses (below) in Thunder Brook are not assessed at this time.

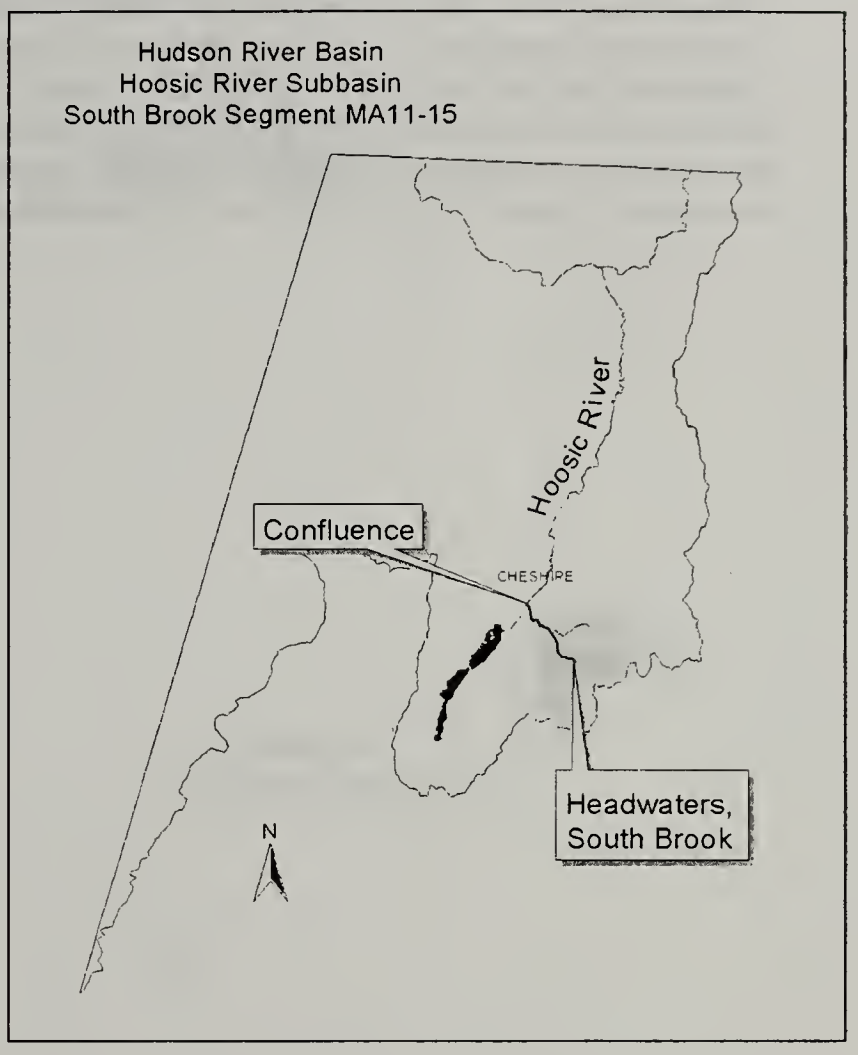
Aquatic Life	Fish Consumption	Drinking Water	Primary Contact	Secondary Contact	Aesthetics
					

RECOMMENDATIONS

Review information from the draft *Assessment of Land Use Activities and Nonpoint Source Pollution in the Hoosic River Watershed* (BRPC 1998). This report contains an up-to-date summary of existing and potential nonpoint sources of pollution in the Hoosic River Subbasin. Specifically, one subwatershed planning area – "South Main Hoosic" is relevant to Thunder Brook (MA11-10). Determine if any problems identified in the BRPC report warrant further investigation (water quality monitoring, etc.) and/or remediation (streambank stabilization, etc).

SOUTH BROOK (SEGMENT MA11-15)

Location: Source, Cheshire to confluence with Kitchen Brook, Cheshire. Segment Length: 4.0 miles.
Classification: Class B, High Quality Water.



SEGMENT DESCRIPTION

South Brook originates between North and Weston Mountains in Dalton and flows through a steep ravine in a northerly direction into Cheshire. The topography changes slightly (grade lessens) and the brook turns west and then northwest, flowing adjacent to Notch Road. South Brook receives the flow from McDonald Brook after crossing under Notch Road. South Brook continues to flow northwest to its confluence with the Hoosic River.

There is a landfill in this subwatershed adjacent to the brook (MassGIS, Solid Waste Facilities, MADEP DWP November 1997 coverage).

Land-use estimates for the subwatershed (map inset, gray shaded area):

Forest	87%
Agriculture	10%
Residential	1%

Land-use estimates in the 100' buffer:

Forest	76%
Residential	17%
Open Land	4%

WITHDRAWALS AND DISCHARGES

None known.

USE ASSESSMENT

Overall, no current data were available to determine if this entire segment meets water quality standards.

SUMMARY

All designated uses (below) in South Brook are not assessed at this time.

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics

Historical Aquatic Life Information

In 1976 DFWELE (Project No. F-36-R-8) conducted a fish population survey in South Brook. Sampling was conducted off of Notch Road capturing brown and brook trout, longnose suckers, longnose and blacknose dace, and slimy sculpin (MA DEP 1997a, Attachment 1).

RECOMMENDATIONS

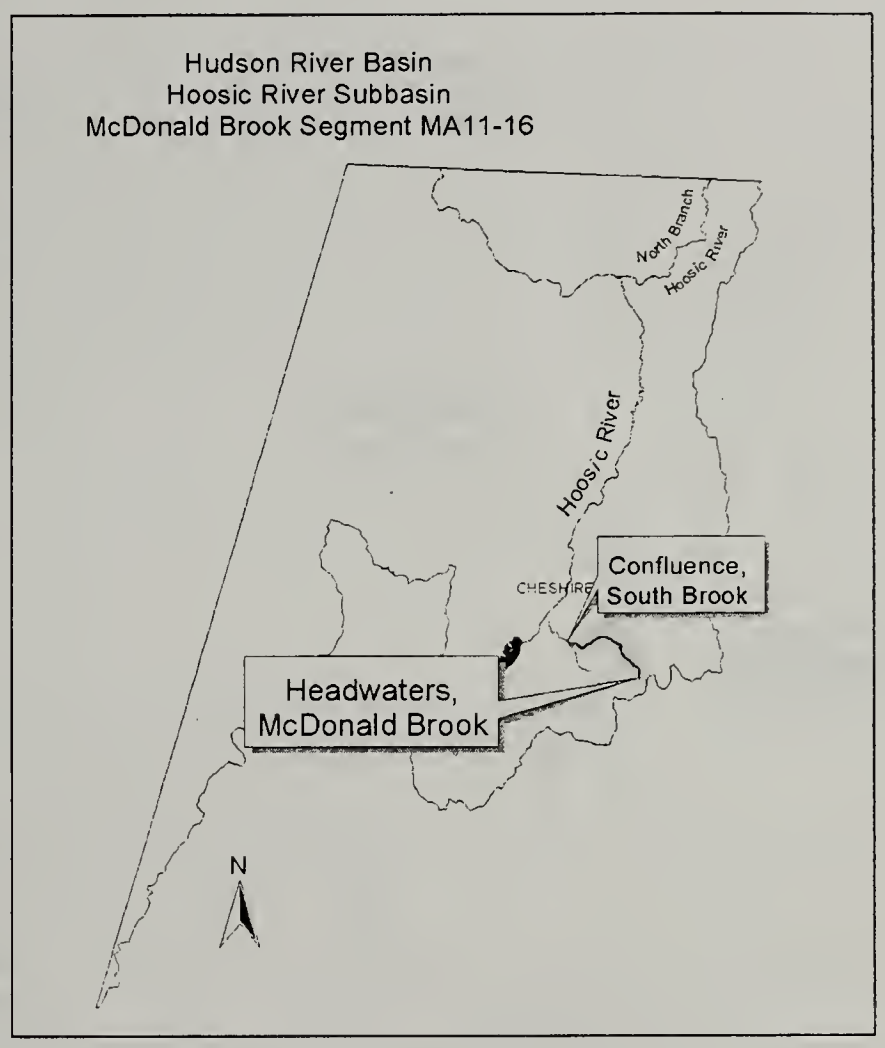
- Review information from the draft *Assessment of Land Use Activities and Nonpoint Source Pollution in the Hoosic River Watershed* (BRPC 1998). This report contains an up-to-date summary of existing and potential nonpoint sources of pollution in the Hoosic River Subbasin. Specifically, one subwatershed planning area – "South Main Hoosic" is relevant to South Brook (MA11-15). Determine if any problems identified in the BRPC report warrant further investigation (water quality monitoring, etc.) and/or remediation (streambank stabilization, etc).
- Investigate impacts, if any, of the landfill (leachate and debris).

McDONALD BROOK (SEGMENT MA11-16)

Location: Source southeast of Woodchuck Hill, Windsor to confluence with South Brook, Cheshire. Segment Length: 3.0 miles. Classification: Class B, High Quality Water.

SEGMENT DESCRIPTION

McDonald Brook originates to the southeast of Woodchuck Hill in Windsor and flows in a northwesterly direction into Cheshire. The topography changes slightly (grade lessens) as the brook approaches Windsor Road. Here McDonald Brook turns west/southwest and flows to its confluence with South Brook in Cheshire.



There is a landfill in this subwatershed adjacent to the brook (MassGIS, Solid Waste Facilities, MADEP DWP November 1997 coverage).

Land-use estimate for the subwatershed (map inset, gray shaded area):

Forest	71%
Agriculture	25%
Open Land	2%

Land-use estimate in the 100' buffer:

Forest	80%
Agriculture	19%
Residential	1%

WITHDRAWALS AND DISCHARGES

None known.

USE ASSESSMENT

Overall, no current data were available to determine if this segment meets water quality standards.

SUMMARY

All designated uses (below) in McDonald Brook are not assessed at this time.

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
				

RECOMMENDATIONS

- Review information from the draft *Assessment of Land Use Activities and Nonpoint Source Pollution in the Hoosic River Watershed* (BRPC 1998). This report contains an up-to-date summary of existing and potential nonpoint sources of pollution in the Hoosic River Subbasin. Specifically, one subwatershed planning area – "South Main Hoosic" is relevant to McDonald Brook (MA11-16).

Determine if any problems identified in the BRPC report warrant further investigation (water quality monitoring, etc.) and/or remediation (streambank stabilization, etc).

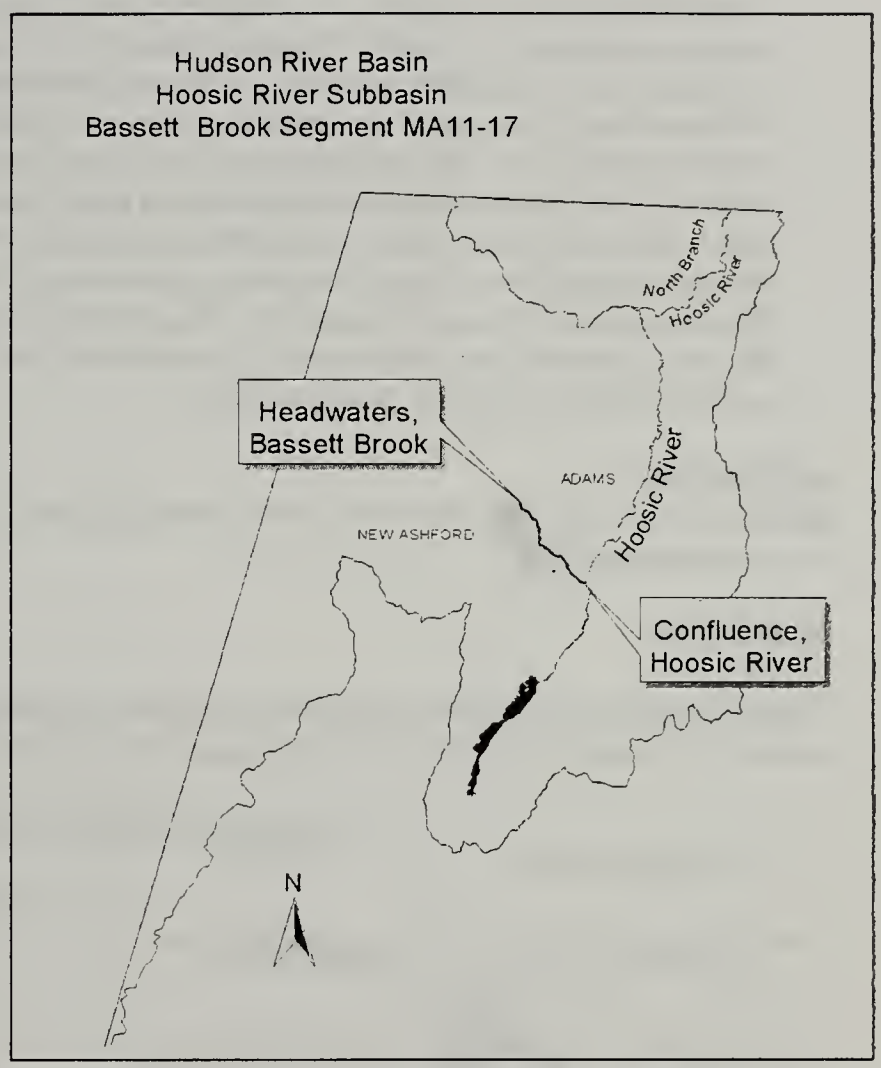
- Investigate impacts, if any, of the landfill (leachate and debris).

BASSETT BROOK (SEGMENT MA11-17)

Location: Source west of West Mountain Road, Adams to inlet of Bassett Reservoir, Cheshire. Segment Length: 1.9 miles. Classification: Class A, Public Water Supply

SEGMENT DESCRIPTION

Bassett Brook, a Class A water, originates on the southeast slope of Saddle Ball Mountain in the Mount Greylock State Reservation in Adams. The brook flows southeast down a steep ravine and crosses under Fred Mason Road prior to entering Bassett Reservoir in Cheshire.



Land-use estimate for the subwatershed (map inset, gray shaded area):

Forest	96%
Agriculture	2%
Residential	1%

Land-use estimate in the 100' buffer:

Forest	97%
Wetlands	1%
Residential	1%

A proposed development, Greylock Glen, is a public/private development venture proposed by the DEM. The 1063 acre facility, which includes a golf course, environmental center, conference center, ski area and condominium development, is proposed to be located on the eastern face of Mt Greylock, above the town of Adams. The project is progressing through the MEPA Process and is expected to submit a final Environmental Impact Statement by December 1999. The Facility is proposing to use town water to supply all potable water, irrigation, and snow-making needs. Wastewater is proposed to be treated at the Adams WWTP. The facility is expected to use approximately 0.47 MGD in the first phase and an additional 0.44 MGD in the second phase.

WITHDRAWALS AND DISCHARGES

WMA:

1. PWS # 1004000-01S Adams Fire District supplies approximately 94% of the water to the town of Adams. Registered volume was 2 MGD. Permitted volume was 0.16 MGD. The former source, Bassett Brook Reservoir, has been replaced with the existing ground water sources as a result of the Surface Water Treatment Rule. The four wells are located on the east-side of Route 8, approximately one mile south of the center of town.

   Adams Fire District has a registered volume of 2.0 MGD and an additional permitted volume of 0.16 MGD for the wells. The Water Department is presently using approximately 1.4 MGD according to the 1998 Annual Statistical Report.

USE ASSESSMENT

AQUATIC LIFE

Biology

The 1997 DWM RBPIII survey was conducted in Bassett Brook upstream of the pipeline crossing in Cheshire (benthic station BB00) (Appendix C). The data collected from this station were compared to

the regional reference station (GE01) on the East Branch Green River. The RBPIII analysis indicated 54% comparability to the reference station. Although comparison indicates slight impairment, conditions are considered naturally occurring. Habitat quality conditions in this stream were excellent.

The DWM fish population survey (RBPV) was conducted beginning 30 m upstream of a low dam located upstream of Bassett Reservoir and Fred Mason Road and in Cheshire. Sampling proceeded upstream to the pipeline crossing. This exceptionally clear stream averaged 4m in width and was 90% shaded. Instream fish cover consisted of mostly boulders and cobble. Electroshocking efficiency was excellent. The fish assemblage (Appendix B, Table B6) was made up entirely of brook trout. Although numbers were low, there were a good number of young-of-the-year and a large number of fish "holed up" in the large pool formed by the aforementioned low head dam. This is obviously an isolated population of brook trout with no chance of re-population from downstream sources due to the presence of Bassett Reservoir. The presence of brook trout only in high gradient streams such as Bassett Brook is not uncommon. These results are similar to the findings of the 1976 DFWELE survey (MA DEP 1997a, Attachment 1).

AESTHETICS

Based on the 1997 DWM habitat assessment (Appendix C), and observations by field sampling staff, this use is supported.

SUMMARY

There is not enough current data/information to assess all uses. Data/information was available to assess the aquatic life and aesthetics uses and is summarized below.

Bassett Brook (MA11-17) Use Summary Table

Designated Uses		Status	Causes		Sources	
			Known	Suspected	Known	Suspected
Aquatic Life		1.9 miles support				
Fish Consumption		1.9 miles not assessed				
Drinking Water		1.9 miles not assessed				
Primary Contact		1.9 miles not assessed				
Secondary Contact		1.9 miles not assessed				
Aesthetics		1.9 miles support				

RECOMMENDATIONS

ADDITIONAL MONITORING

To monitor impacts of any development in this subwatershed:

- Repeat the biological monitoring (benthic and fish surveys) and compare the results (pre vs. post development).

IMPLEMENTATION

- Review information from the draft *Assessment of Land Use Activities and Nonpoint Source Pollution in the Hoosic River Watershed* (BRPC 1998). This report contains an up-to-date summary of existing and potential nonpoint sources of pollution in the Hoosic River Subbasin. Specifically, one

subwatershed planning area – "South Main Hoosic" is relevant to Bassett Brook (MA11-17). Determine if any problems identified in the BRPC report warrant further investigation (water quality monitoring, etc.) and/or remediation (streambank stabilization, etc).

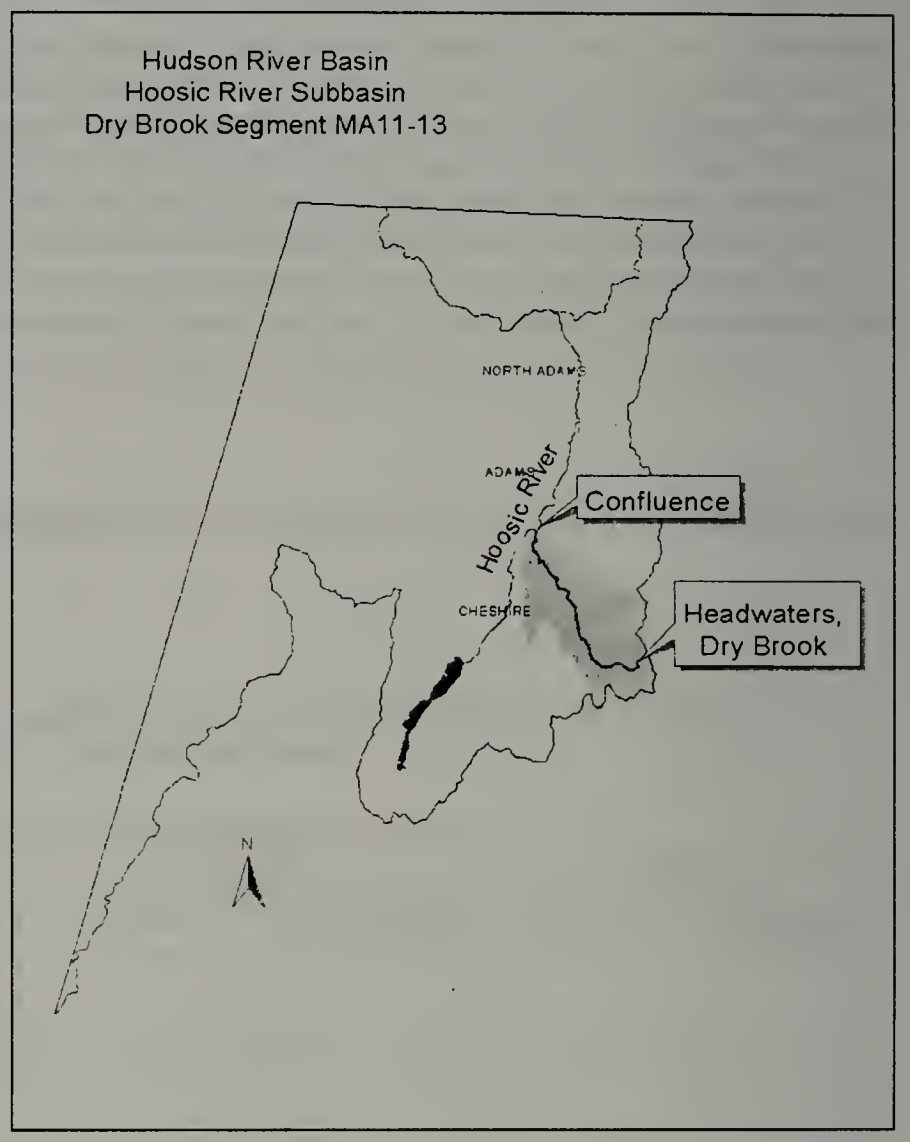
- Consider fish passage possibilities at low head dam.

DRY BROOK (SEGMENT MA11-13)

Location: Source west of Jackson Road Savoy (in the Savoy Wildlife Management Area) to the confluence with the Hoosic River, Adams. Segment Length: 4.9 miles. Classification: Class B, High Quality Water.

SEGMENT DESCRIPTION

Dry Brook, a Class B water, originates near the Windsor/Savoy line west of Jackson Road in Windsor. The brook flows southwest through a small wetland and continues to flow west along Cheshire Road, Windsor/Sand Mill Road, Cheshire. The brook continues in a northwesterly direction, past the Hoosac Valley High School in Cheshire to its confluence with the Hoosic River just upstream of the USGS gage (01331500) in Adams



Land-use estimate for the subwatershed (map inset, gray shaded area):

Forest	64%
Agriculture	26%
Residential	4%

Land-use estimate in the 100' Buffer:

Forest	62%
Wetlands	31%
Residential	7%

WITHDRAWALS AND DISCHARGES

None known.

USE ASSESSMENT

Overall, no current data were available to determine if this segment meets water quality standards.

SUMMARY

All designated uses (below) in Dry Brook are not assessed at this time.

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
				

Historical Aquatic Life Information

In 1976 DFWELE (Project No. F-36-R-8) conducted a fish population survey in Dry Brook (a stocked stream at that time). Brown trout (particularly young-of-the-year) were abundant. Other species captured included longnose sucker, longnose and blacknose dace, and creek chub (MA DEP 1997a, Attachment 1).

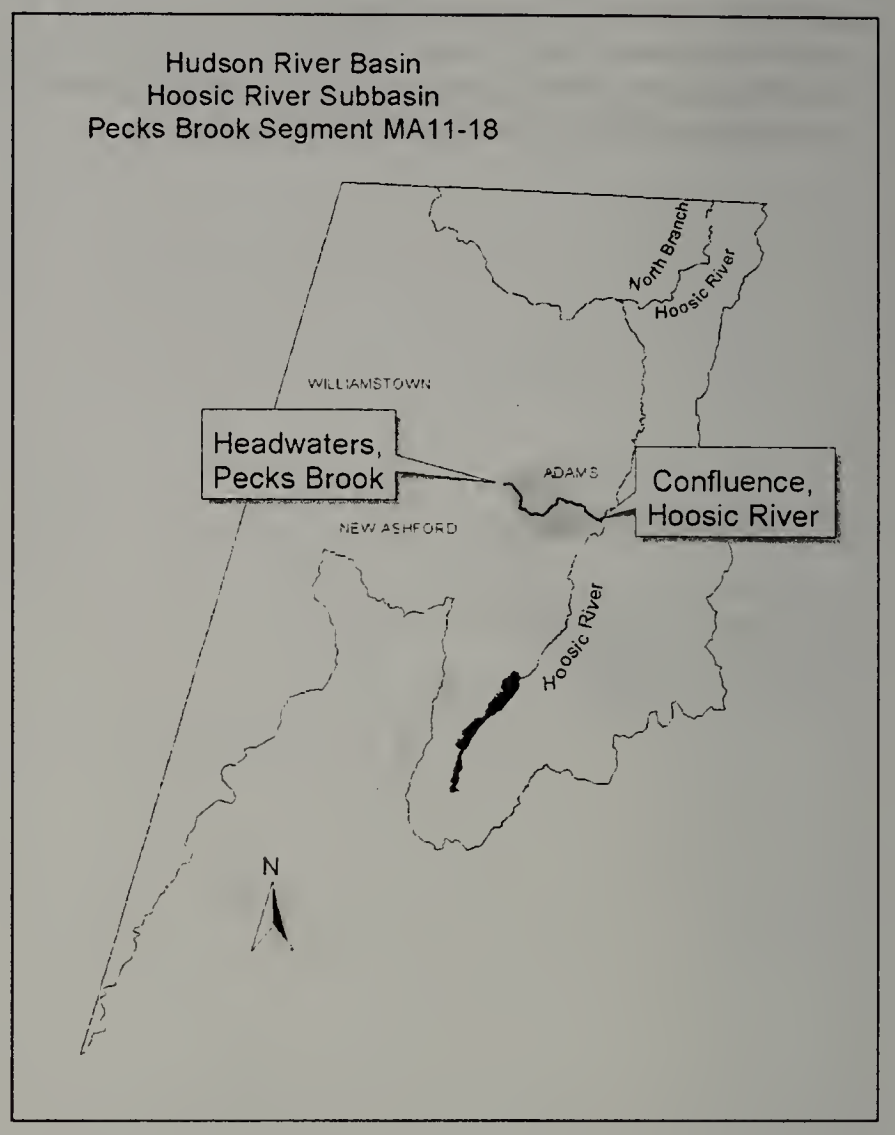
RECOMMENDATIONS

Review information from the draft *Assessment of Land Use Activities and Nonpoint Source Pollution in the Hoosic River Watershed* (BRPC 1998). This report contains an up-to-date summary of existing and potential nonpoint sources of pollution in the Hoosic River Subbasin. Specifically, one subwatershed planning area – "South Main Hoosic" is relevant to Dry Brook (MA11-13). Determine if any problems identified in the BRPC report warrant further investigation (water quality monitoring, etc.) and/or remediation (streambank stabilization, etc).

PECKS BROOK (SEGMENT MA11-18)

Location: Source west of West Mountain Road, Adams to confluence with the Hoosic River, Adams. Segment Length: 2.7 miles. Classification: Class B, High Quality Water.

SEGMENT DESCRIPTION



Pecks Brook, a Class B High Quality Water, originates on the eastern slope of Saddle Ball Mountain in the Mt. Greylock State Reservation in Adams. The brook flows southeast down a steep ravine and then turns northeast and parallels West Mountain Road. It then flows through Dean's Pond (a small old mill pond), crosses under West Road, and joins with the Hoosic River in the city of Adams.

Land-use estimate for the subwatershed (map inset, gray shaded area):

Forest	73%
Agriculture	19%
Residential	5%

Land-use estimate in the 100' buffer:

Forest	83%
Residential	7%
Agriculture	3%

A proposed development, Greylock Glen, is a public/private development venture proposed by DEM. The 1063 acre facility, which includes a golf course, environmental center, conference center, ski area and condominium development, is located on the eastern face of Mount Greylock, above the town of Adams. The project is progressing through the MEPA Process and is expected to submit a final Environmental Impact Statement by December 1999. The Facility is proposing to use town water to supply all potable water, irrigation, and snow-making needs. Wastewater is proposed to be treated at the Adams WWTP. The facility is expected to use approximately 0.47 MGD in the first phase and an additional 0.44 MGD in the second phase.

WITHDRAWALS AND DISCHARGES

None known.

USE ASSESSMENT

AQUATIC LIFE

Biology

The 1997 DWM RBPIII survey was conducted in Pecks Brook between the pipeline and powerline crossings in Adams (benthic station PB00) (Appendix C). The data collected from this station were compared to the regional reference station (GE01) on the East Branch Green River. The RBPIII analysis indicated 71% comparability to the reference station. Although comparison indicates slight impairment, conditions are considered naturally occurring. Habitat quality conditions in this stream were excellent.

The DWM fish population survey (RBPV) was conducted starting at the high-tension line crossing and proceeding upstream to the base of the gorge. The reach was 50% shaded with fish cover in the

form of boulders, cobble, gravel, and overhanging vegetation. Electroshocking efficiency was rated as excellent with a greater than 90% pick-up. Fish present in order of abundance included brook trout, brown trout and one blacknose dace (Appendix B, Table B6). The majority of fish present were young-of-the-year salmonids. These results are similar to the findings of the 1976 DFWELE survey (MA DEP 1997a, Attachment 1).

Chemistry

Temperature

A citizen survey was conducted from August to September 1999 at one location in Pecks Brook (Schlesinger 1999a, 1999c and 1999c). A temperature data logger was deployed which recorded hourly measurements. The maximum mean monthly temperature did not exceed 68°F (20°C) either month.

AESTHETICS

Based on the 1997 DWM habitat assessment (Appendix C) and observations by field staff, this use is fully supported.

SUMMARY

There is not enough current data/information to assess all uses. The status of the aquatic life and aesthetics uses are summarized below.

Pecks Brook (MA11-13) Use Summary Table

Designated Uses		Status	Causes		Sources	
			Known	Suspected	Known	Suspected
Aquatic Life		2.7 miles support				
Fish Consumption		not assessed				
Primary Contact		not assessed				
Secondary Contact		not assessed				
Aesthetics		2.7 miles support				

RECOMMENDATIONS

ADDITIONAL MONITORING

To fully assess the status of each use in this segment:

- If not currently sampled by DEM, collect bacteria samples in the vicinity of the small impoundment in the Peck's Brook subwatershed, within Greylock Glen. Impoundment is used as a swimming area.

To monitor impacts of any development in this subwatershed:

- Repeat the biological monitoring (benthic and fish surveys) and compare the results (pre vs. post development). If impacts are detected identify sources then evaluate the need for additional BMPs.

IMPLEMENTATION

Review information from the draft *Assessment of Land Use Activities and Nonpoint Source Pollution in the Hoosic River Watershed* (BRPC 1998). This report contains an up-to-date summary of existing and

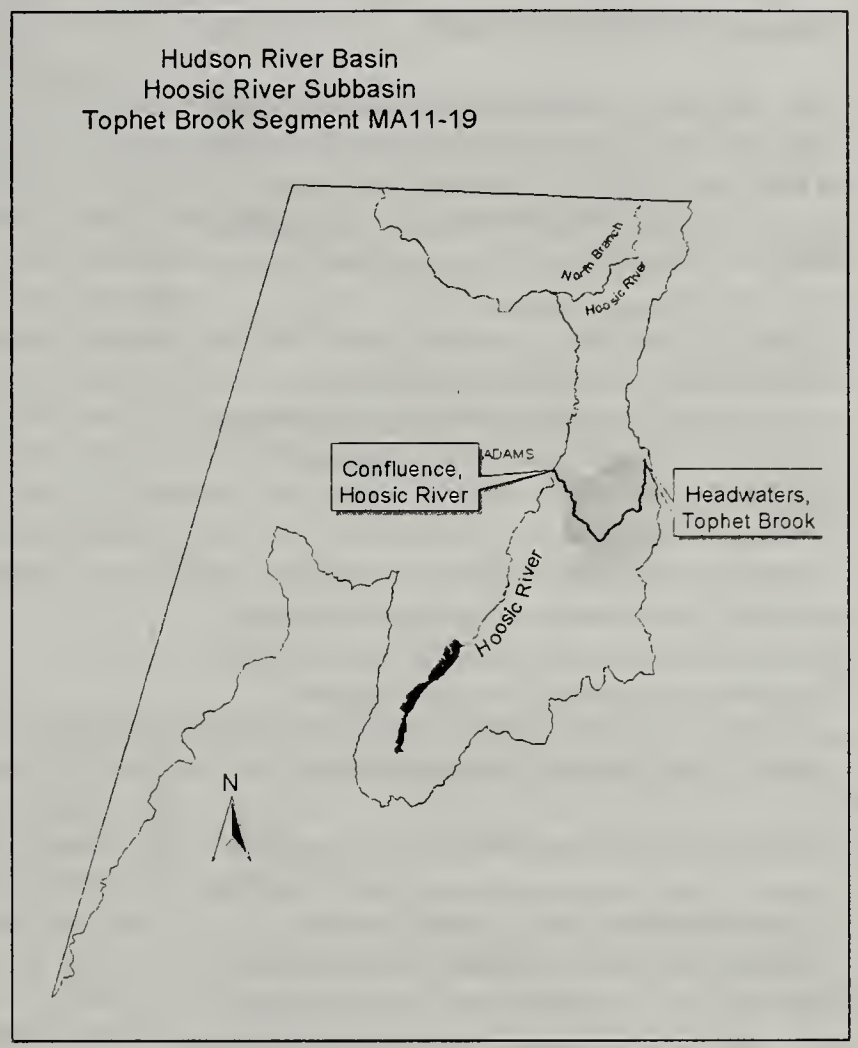
potential nonpoint sources of pollution in the Hoosic River Subbasin. Specifically, one subwatershed planning area – "South Main Hoosic" is relevant to Peck's Brook (MA11-18). Determine if any problems identified in the BRPC report warrant further investigation (water quality monitoring, etc.) and/or remediation (streambank stabilization, etc).

TOPHET BROOK (SEGMENT MA11-19)

Location: Source west of Jackson Road Savoy (in the Savoy Wildlife Management Area) to the confluence with the Hoosic River, Adams. Segment Length: 5.9 miles. Classification: Class B, High Quality Water.

SEGMENT DESCRIPTION

Tophet Brook, a Class B High Quality Water, originates in the Hoosac Range along the Savoy/Adams municipal boundary. The brook flow due south and crosses under East Hoosac Street /Adams Road and then turns southwest. Here the brook flows down a steep ravine and receives the flow from Patton Brook. Tophet Brook turns northwest towards its confluence with the Hoosic River in the city of Adams. Two other tributaries, Reed and Miller Brooks also join Tophet Brook in its lower reach.



Land-use estimate for the subwatershed (map inset, gray shaded area):

Forest	75%
Agriculture	20%
Residential	4%

Land-use estimate in the 100' buffer:

Forest	97%
Agriculture	2%
Residential	1%

WITHDRAWALS AND DISCHARGES

None known.

USE ASSESSMENT

Overall, no current data were available to determine if this segment meets water quality standards.

SUMMARY

All designated uses (below) in Tophet Brook are not assessed at this time.

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
				

Historical Aquatic Life Information

In 1976 DFWELE (Project No. F-36-R-8) conducted a fish population survey in Tophet Brook. Four species of fish were found with brook trout most common (longnose and blacknose dace and longnose sucker). MA DEP 1997a, Attachment 1

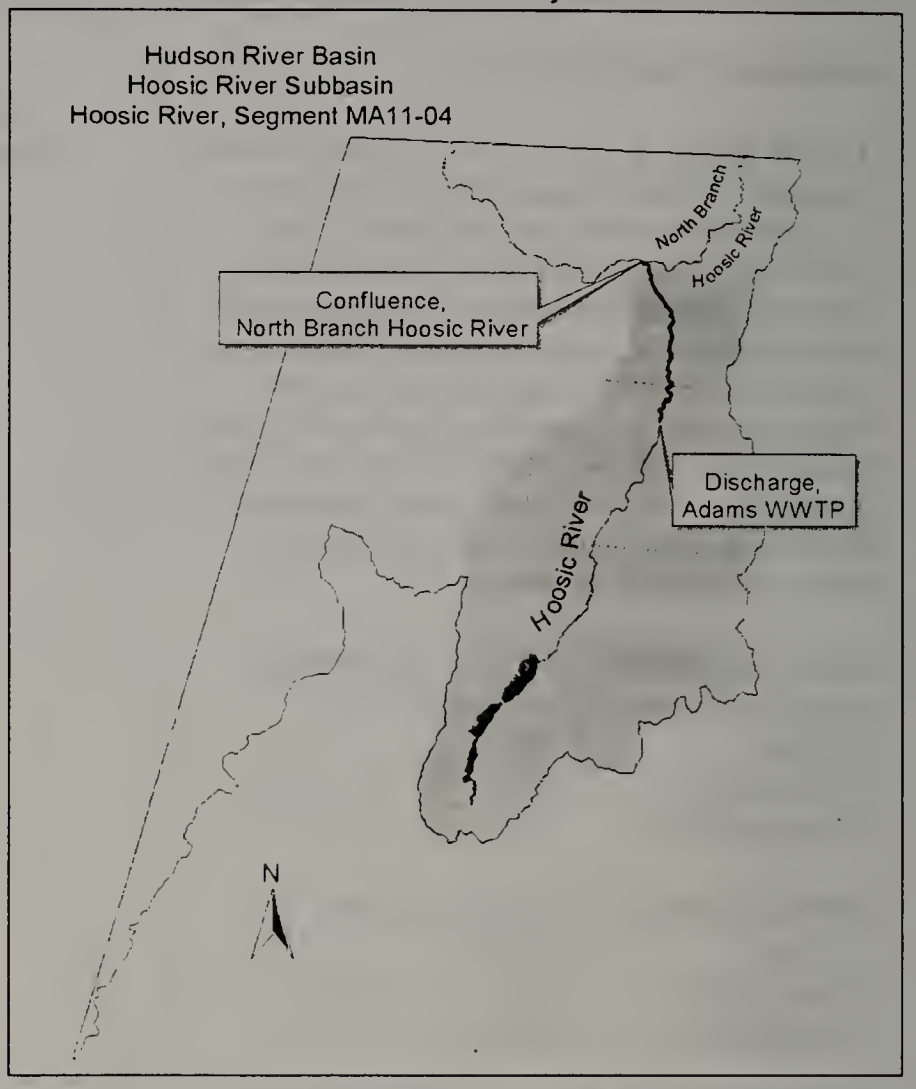
RECOMMENDATIONS

Review information from the draft *Assessment of Land Use Activities and Nonpoint Source Pollution in the Hoosic River Watershed* (BRPC 1998). This report contains an up-to-date summary of existing and potential nonpoint sources of pollution in the Hoosic River Subbasin. Specifically, one subwatershed planning area – "Mid Main Hoosic" is relevant to Tophet Brook (MA11-19). Determine if any problems identified in the BRPC report warrant further investigation (water quality monitoring, etc.) and/or remediation (streambank stabilization, etc).

HOOSIC RIVER (SEGMENT MA11-04)

Location: Adams WWTP discharge, Adams to the confluence with the North Branch Hoosic River, North Adams. Segment Length: 4.3 miles. Classification: Class B, Warm Water Fishery.

SEGMENT DESCRIPTION



This segment, the second of the mainstem Hoosic River, encompasses the remainder of the river (locally known as the *South Branch Hoosic River*) between the Adams WWTP discharge and the confluence with the North Branch Hoosic River. Four tributaries, including Southwick, Cheeseboro, Bowerman and Phillips brooks (none of which are assessed in this report) discharge to this segment of the Hoosic River.

This segment of the Hoosic River flows in a northerly direction through the floodplain between the Hoosac and Taconic ranges. The bedrock geology in this region is generally a carbonate base with a mix of metamorphic and sedimentary forms.

At the upstream end of this segment, the Hoosic River receives the effluent from the Adams WWTP. Three tenths of a mile downstream from this point, the Specialty Minerals, Inc. facility discharges via outfall #001 treated process, non-contact cooling, quarry water and stormwater runoff into the Hoosic River. The river meanders through the Zylonite area of Adams and enters North Adams. It crosses under Hodges Cross Road and passes by the Southview Cemetery. The river passes under Hunter Foundry Road, downstream from which it has been channelized for flood control purposes (grassy bermed banks) for a distance of 0.7 miles. Within this reach, a railroad yard sits in close proximity to the eastern bank of the river. Slightly north of Haskins School yard, the Hoosic River is once again encased in a concrete channel for the 0.6 mile reach to its confluence with the North Branch Hoosic River.

Land-use estimate for the subwatershed (map inset, gray shaded area):

Forest	70%
Agriculture	15%
Residential	7%

Land-use estimate in the 100' buffer from the streambanks:

Agriculture	39%
Industrial	9%
Forest and Open Land	8% each

WITHDRAWALS AND DISCHARGES

WMA:

1. PWS #1209000-02G—North Adams Water Department. The Curran Well (located along this segment of the mainstem Hoosic River) is not currently active and was approved for abandonment by the Department on 30 June 1999.
2. WMA Reg. # 1-01-004.02 and Permit # 9P-1-01-004.02 -- Specialty Minerals, Inc. (formerly Pfizer Company), is an industrial facility which conducts a mining operation in the Town of Adams. The facility is located on Route 8, in the north end of Adams. The facility draws approximately 4 MGD from five drilled wells around the facility (based on 1997 flow figures). Wells 1 - 5 have WMA registration allowances totaling 3.7 MGD and a permit for an additional 1.91 MGD (through the 1998 period). The total withdrawal is 4.15 MGD. The permit is up for review.
3. WMA Reg. # 1-01-004.01 – Crown Vantage Inc. (formerly James River Paper) is and industrial facility, located just north of SMI in the Town of Adams. The facility has a registration allowance of 0.63 MGD. The facility drew approximately 0.835 MGD from two ground water sources during the 1998 year.
4. WMA Reg. # 1-01-004.03 – Mount Greylock Natural Spring Water Corp. (formerly Butterworth Water Company) is located on Glenn Street in the Town of Adams. The water source, which was expected to provide water for a bottling water facility has not yet been used. The facility had a WMA Registration allowance of 0.72 MGD, however the registration was voided on 23 August 1999. There has been no water used from the spring since 1981.

NPDES:

1. MA0100315 issued September 1992. Adams Wastewater Treatment is authorized to discharge via outfall #001 5.1 MGD of treated wastewater to the Hoosic River. The permit limits for whole effluent toxicity are $LC_{50} \geq$ 100% and CNOEC$\geq$ 40% effluent. The permit was modified in July 1996 reducing the toxicity testing requirements to only one test organism (*C. dubia*). Dechlorination was also implemented at the facility in August 1994 to meet the TRC limit of 0.022 mg/L.
2. MA0005991 issued September 1975. Specialty Minerals, Inc. (formerly Pfizer, Inc.) Currently under original Pfizer, Inc. permit. Original permit limits for Outfall #001A (process related wastewater) 0.75 MGD. Daily maximum limits were as follows: T 92°F, TSS 60 mg/L, and Turbidity 60 JTU. Outfall # 001 of 1.5 MGD (daily average) and turbidity 60 JTU. A draft permit is being developed for Specialty Minerals, Inc.

Stormwater Permits:

1. MAR00A730 – Specialty Minerals Inc.
2. MAR00A407 – Crown Vantage (formerly James River Paper)
3. MAR05A534 – Lane Construction
4. MAR05A138 – Mohawk Auto Wrecking
5. MAR05A489 – Coury's Used Auto Parts
6. MAR00B173 – Apkins and Sons, Inc.
7. MAR00A603 – Catamount Pellet Fuel, Corp.

USE ASSESSMENT

AQUATIC LIFE

Biology

The 1997 DWM RBPIII survey was conducted approximately 450m downstream of the Adams WWTP discharge (benthic station HR07D) (Appendix C). The data collected from this station were compared to the regional reference station (GE01) on the East Branch Green River. The RBPIII analysis indicated 54% comparability to the reference station – indicative of slight impairment. Compared against its upstream reference (HR07U), no impairment was detected. Because of the degree of impairment detected, the aquatic life use is assessed as partial support.

Habitat quality conditions in the Hoosic River where the concrete flood control structures/riprap streambed exist (near the Haskins School Yard to the confluence with the North Branch Hoosic River) have been adversely affected. This 0.6-mile reach therefore does not support the aquatic life use as a result of this channelization.

In 1976 DFWELE (Project No. F-36-R-8) conducted a fish population survey in this reach of the Hoosic River downstream from Hodges Cross Road in North Adams (MA DEP 1997a, Attachment 1). Only three species, white suckers most common, were collected. The other two species included longnose sucker and brook trout. No recent fish population work has been done in this segment of the Hoosic River.

The Hudson River Basin Plan Volumes I, II, and III (DEM 1989a, 1989b, and 1989c) determined that an 8% reduction of streamflow occurred in this segment of the Hoosic River due to industrial water withdrawals (primarily SMI and Crown Vantage). The reduction in streamflow is not a major concern in this segment at this time (the Adams WWTP and SMI discharges return water to the Hoosic River). It should be noted however that there are potential increases in water use (88% for five industrial users by the year 2010). Streamflow measured during the 1997 DWM surveys was not less than 31 cfs upstream of Hodges Cross Road, North Adams (Appendix B, Table B2).

Toxicity

The Adams WWTP has conducted whole effluent toxicity tests on a quarterly basis since 1992. With the exception of the December 1992 test event, no acute toxicity has been detected in the Adams WWTP effluent (Dallaire 1999b). No exceedences of the CNOEC limit have been reported either.

Chemistry - water

DO

Dissolved oxygen was measured at one station by DWM (HR07- upstream of Hodges Cross Road Bridge in North Adams) on three occasions in 1997 (Appendix B, Table B3). DO was not less than 9.1 mg/L nor 97% saturation. Although the data set is limited and no measurements were taken pre-dawn, there are no current concerns regarding instream DO.

Temperature

Temperature was measured by DWM at the same station and time as DO described above. The maximum temperature was 20.1°C (Appendix B, TableB3).

A citizen survey was conducted from May through August 1999 at multiple locations in this reach of the Hoosic River several of which were within the mixing zone of the SMI discharge (Schlesinger 1999a, 1999b, and 1999c). Temperature data loggers were deployed which recorded hourly measurements. None of the instream maximum mean monthly temperatures exceeded 83°F (28.3°C) between June and August 1999. Although there is limited documentation regarding sensor placement, and the lack of a QAPP, these data do not suggest thermal impacts to this warm water fishery segment. However, the SMI discharge does exert a temperature increase ($\Delta T > 5°F$) in the Hoosic River. Since extent of the temperature increase is unknown, the zone of impact is undetermined. Furthermore, the SMI facility is negotiating with EPA and DEP to increase their discharge volume, the potential effects on the Hoosic River are under review at this time. These data serve to place the waters directly down stream from the discharge on an "alert status".

pH

pH was measured at the same station and dates as DO described above. All pH measurements were above 8.0 SU, indicative of the carbonate-based watershed (Appendix B, Table B3).

Turbidity

A very limited data set was collected by DWM in 1997. No problems were indicated (Appendix B, Table B4).

Suspended Solids

SS samples were collected by DWM at the same location and dates as DO described above. None of the samples exceeded 25 mg/L. Therefore, no impairment was due to suspended solids (Appendix B, Table B4).

Ammonia-Nitrogen

NH_3-N samples were collected by DWM at the same location and dates as DO described above. Levels were well below the instream water quality criteria (Appendix B, Table B4).

Phosphorus

TP samples were collected by DWM at the same location and dates as DO described above. Concentrations did not appear to be elevated therefore no impairment was noted due to this variable (Appendix B, Table B4).

Total Residual Chlorine

TRC measurements were reported in the Adams WWTP toxicity testing reports. Dechlorination has been implemented at the Adams WWTP. The highest effluent TRC measurement was 0.08 m/L (September 1997). Thirteen percent of the measurements were above the minimum quantification limit (0.05 mg/L). These data serve to place the Hoosic River downstream of the Adams WWTP discharge on an "alert status" (Dallaire 1999b).

Chemistry –sediment

Results of EPA sampling along this segment of the Hoosic River (summarized below) conducted in September 1998 (Nolan 1999) are as follows:

- at Hodges Cross Road, North Adams— sediment PCBs were below detection. When compared to the Provincial Sediment Quality Guidelines, no toxic element concentrations were above levels of concern. The sediment sample was comprised of approximately 84% fine sand (0.075mm) and 14% silt and clay. Both total organic carbon (TOC) and polycyclic aromatic hydrocarbons (PAHs) concentrations (12,153 and 6.6 ppm dry weight, respectively) were above the L-EL guidelines (Persaud *et. al.*, 1993). With the exception of Endrin Ketone, the organochlorine pesticide analysis did not detect any compounds that exceeded their L-EL guidelines (total DDT = 0.006 ppm dry weight). Endrin Ketone was detected (0.0043 ppm dry weight) although the laboratory reported the lower value (dual capillary analysis) noting that the confirmation value exceeded 35% difference and is less than 100%. The Provincial Sediment Quality Guideline for Endrin is 0.003 ppm dry weight (Persaud *et. al.*, 1993).
- near Haskins Park (in the "concrete channel" – sediment PCBs (0.149 ppm dry weight) exceeded the L-EL guideline. When compared to the Provincial Sediment Quality Guidelines, no toxic element concentrations were above levels of concern. The sediment sample was comprised of approximately 79% fine sand (0.075mm) and 19% silt and clay. Both total organic carbon (TOC) and polycyclic aromatic hydrocarbon (PAHs) concentrations (14,216 and 10.8 ppm dry weight, respectively) were above the L-EL guidelines (Persaud *et. al.*, 1993). The organochlorine pesticide analysis (total DDT = 0.0059 ppm dry weight) did not exceed the L-EL guideline.

Chemistry –tissue

EPA collected hydropsychid caddisfly larvae in September 1998 from the Hoosic River near Haskins Park in North Adams (Nolan 1999). Additional information and guidance are needed to utilize this information in the aquatic life use assessment.

Although the 1998 EPA data set has not been formally reported on, a review of the sediment data suggests the presence of a source of PCBs to the Hoosic River somewhere between Hodges Cross Road and Haskins Park in North Adams. The sediment samples also contained elevated concentrations of TOC and PAHs (suspected causes), which may cause impairment of the aquatic life use.

FISH CONSUMPTION

This use is no longer assessed.

PRIMARY CONTACT

Too little data are available to assess this use (Appendix B, Table B5).

SECONDARY CONTACT

Too little data are available to assess this use (Appendix B, Table B5).

AESTHETICS

Based on the 1997 DWM habitat assessment (Appendix C), and observations by field sampling staff, the upper 2.5 miles are supported for this use. There is an auto salvage yard along the east bank of the Hoosic

River near the Hunter Foundry Bridge. Here, the South Branch Stream Team (Hoosic River Watershed Association 1999) identified junk cars and parts in the river and along the banks. Although this condition is unacceptable, it is probably a localized problem. The lower 1.8 miles are not assessed at this time. An overriding objectionable condition (concrete channel) is not an aesthetic issue according to the use assessment guidance but rather an aquatic life issue related to habitat quality.

SUMMARY

Physical alteration (flood control structures) of the streambed and banks has resulted in a reduction of habitat available for aquatic life thus impairing the aquatic life use at the lower end of this segment. Although no impacts were detected in the benthic macroinvertebrate community in the Hoosic River downstream of the Adams WWTP discharge as compared to upstream of the discharge, slight impairment was detected when the data were compared to the watershed reference station. The aquatic life use is therefore assessed as partial support due to unknown upstream sources of pollution. No other sampling of the benthic community was conducted in the downstream reaches of the segment although conditions are not expected to improve (SMI discharge and land-use activities including cropland and commercial development adjacent to the river). Other than instream temperature measurements close to the SMI discharge, the effects of the SMI discharge on the Hoosic River are unknown at this time. Preliminary results of the EPA sampling (1998) suggest that there is a potential source of PCBs between Hodges Cross Road and Haskins Park in North Adams, however further investigation is needed. TOC and PAHs in the sediment samples also exceeded the L-EL guidelines. Auto debris in the Hoosic River and along the banks near Hunter Foundry Bridge need to be removed. The status of each individual use is summarized below.

Hoosic River (MA 11-04) Use Summary Table

Designated Uses		Status	Causes		Sources	
			Known	Suspected	Known	Suspected
Aquatic Life*		Upper 3.7 miles partial support, lower 0.6 mile reach non support	Habitat alteration,	Unknown, PCBs, TOC, PAHs	Channelization	Urban runoff, agriculture, contaminated sediments, hazardous waste site, point source discharges, unknown
Fish Consumption		not assessed				
Primary Contact		not assessed				
Secondary Contact		not assessed				
Aesthetics		Upper 2.5 miles support, lower 1.8 mile reach not assessed				

* "alert status", see USE ASSESSMENT section for details

RECOMMENDATIONS

ADDITIONAL MONITORING

To fully assess the status of each use in this segment:

- Additional benthic stations and habitat assessment are required to characterize the communities along this segment of the Hoosic River in particular downstream of the SMI discharge.
- More extensive spatial and temporal turbidity monitoring to characterize any erosion impacts from existing land use practices and the SMI discharge.
- Bacteria samples at sites throughout the segment on multiple dates and during varied weather conditions should be collected.

- Temperature monitoring needs to be conducted around the thermal discharges (upstream and downstream) to define the mixing zone as well as upstream and downstream of the concrete channels (possible solar heating).

To identify sources and/or extent of impairment/ "alert status":
- Review final report or technical memorandum from EPA on their 1998 Hoosic River sediment and tissue study.
- Additional sampling between Hodges Cross Road and Haskins Park in North Adams is warranted to determine if an additional source of PCB contamination exists.
- Additional benthic sampling along the river to determine the extent of impairment.
- Continue temperature monitoring to determine the impact zone (or mixing zone) of the SMI and any other thermal discharges in this segment of the Hoosic River based on DEP approved methodology.

To identify impacts of stormwater discharges:
- Conduct a streamwalk emphasizing stormwater discharges to this segment (Specialty Minerals Inc., Crown Vantage (formerly James River Paper), Lane Construction, Mohawk Auto Wrecking, Coury's Used Auto Parts, Apkins and Sons, Inc., and Catamount Pellet Fuel, Corp.). Document any current/potential impacts on water quality.

IMPLEMENTATION

Point source
- The Adams WWTP NPDES permit needs to be reissued with appropriate limits.
- The SMI NPDES draft permit needs to be reviewed and the permit reissued (reflective of current operations). If the facility continues to pursue expansion, the NPDES permit should contain appropriate limits to protect water quality (including temperature) in the Hoosic River as a result of the increased discharge. Determine if a discharge from the public storm sewer draining the Zylonite area of Adams also flows into the SMI outfall channel. The need for determining/defining an allowable mixing zone for the SMI discharge warrants consideration. If currently relevant, determine if outfall 001 includes the flow from outfall 001A.
- Identify any discharges that are currently unpermitted. In addition to these facilities (if any) conduct site visits to all NPDES permittees.
- Water conservation measures should be implemented to preserve naturally occurring streamflow patterns and volumes as much as possible.

Non point source
- Review information from the draft *Assessment of Land Use Activities and Nonpoint Source Pollution in the Hoosic River Watershed* (BRPC 1998). This report contains an up-to-date summary of existing and potential nonpoint sources of pollution in the Hoosic River Subbasin. Specifically, two subwatershed planning areas – "Mid Main Hoosic" and "Main Stem" are relevant to this segment (MA11-04) of the Hoosic River. Determine if any problems identified in the BRPC report warrant further investigation (water quality monitoring, etc.) and/or remediation (streambank stabilization, etc).

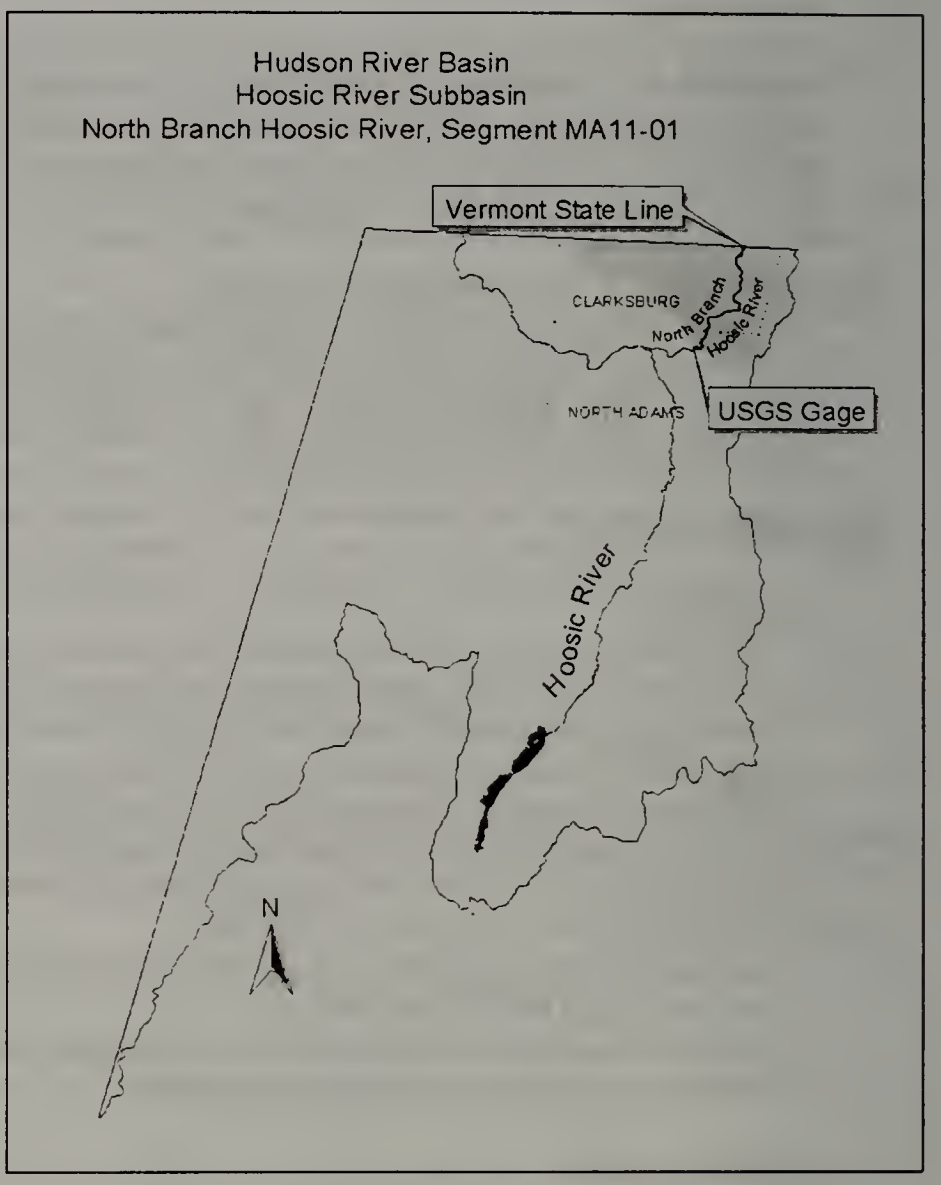
Other
- Remove auto debris from the Hoosic River and bank near Hunter Foundry Bridge.
- Investigate possible ways to increase habitat for aquatic life in the sections of this segment that are impacted by the flood control chutes.

NORTH BRANCH HOOSIC RIVER (SEGMENT MA11-01)

Location: Vermont State Line, Clarksburg to the USGS Gage, North Adams. Segment Length: 4.1 miles.
Classification: Class B, Cold Water Fishery.

SEGMENT DESCRIPTION

This segment starts as the North Branch Hoosic River flows south from the state of Vermont into Clarksburg, Massachusetts. The river flows generally south through Clarksburg bracketed between the Hoosac Range to the east and Route 8 to the west. It receives the flow from an unnamed tributary draining Mauserts Pond just north of Middle Road/East Street and a second unnamed tributary draining Choquettes Pond that joins the North Branch Hoosic River near the North Adams Country Club. Intermittent streams and Canyon Brook drain into the North Branch Hoosic River from the Hoosac Range. The river turns west and crosses under Route 8 north of Briggsville. The river then flows around a small industrial complex, turns south, enters North Adams and continues to parallel Route 8. It then receives the flow from Hudson Brook (encompassed in the Natural Bridge State Park). The river then passes close to residential housing and another small industrial complex, twice crossing under Route 8 to the end of the segment at the discontinued USGS gaging station 01332000 in North Adams.



A PCB remediation site, Beaver Mill, is located along the North Branch Hoosic River between the two crossings of Route 8 near the downstream end of this segment. The American Annuity Group (AAG) currently owns the site. Initial site remediation activities were conducted between December 1998 and July 1999.

Land-use estimates for the subwatershed area contained in Massachusetts (map inset, gray shaded area):

Forest	79%
Residential	9%
Agriculture	7%

Land-use estimates in the 100' buffer from the streambanks:

Forest	54%
Residential	16%
Agriculture	7%

WITHDRAWALS AND DISCHARGES

WMA:

1. PWS # 1063003-01G. Briggsville Water District (formerly Clarksburg Redmills Water Co.), located along the North Branch of the Hoosic River, along Route 8, supplies approximately 10% of Clarksburg's

population. The water system, supplied by a single spring source, located upgradient of the town, uses approximately 0.0063 MGD.

Stormwater Permits:

1. MAR00B008 - Krutiak Wood Products (Clarksburg Center, including Krutiak Wood Products was connected into the new sewer as part of a 1988 agreement with the City of North Adams.)

USE ASSESSMENT

AQUATIC LIFE

Biology

Collection of fish from two stations in this segment of the North Branch Hoosic River was conducted by DWM in 1997 (Appendix B, Table B7). Species included white sucker, longnose sucker, rainbow trout, eastern brook trout, and brown trout.

In 1976 DFWELE (Project No. F-36-R-8) conducted a fish population survey in three stations along this reach of the North Branch Hoosic River (MA DEP 1997a, Attachment 1). Species observed included blacknose and longnose dace, slimy sculpin, white and longnose sucker, brown and brook trout, creek chub, and golden shiner.

Streamflow measurements collected during DWM's 1997 survey, ranged between 5 and 8 cfs (Appendix B, Table B2).

Chemistry - water

DO

Dissolved oxygen was measured at one station by DWM (HR09A- North Branch Hoosic River approximately 20' upstream of confluence with Hudson Brook) on three occasions in 1997 (Appendix B, Table B3). DO was not less than 8.8 mg/L although supersaturation (111 and 114%) did occur. Due to the small data set, limited sample sites and the lack of pre-dawn oxygen readings, the dissolved oxygen dynamics are not well documented. This segment is therefore given an "alert status".

Temperature

Temperature was measured at the same station and dates as DO described above. Two temperature measurements exceeded the cold water fishery standard of 20°C (21.5 and 22.8°C). This places this segment on an "alert status" (Appendix B, Table B3).

pH

pH was measured at the same stations and dates as DO described above. pH ranged between 8.8 and 9.2 SU, overall the highest in the Hoosic River Watershed. While these high values may indicate increased primary productivity, pHs in this range are also likely to be found in a carbonate-based watershed (Appendix B, Table B3).

Turbidity

A very limited data set was collected by DWM in 1997 (Appendix B, Table B4). The instream turbidity levels were slightly less than 10 NTU. There is a small apparently naturally occurring "clay pit" area located in the woods opposite the industrial complex in Briggsville. Downstream from where a spring in this "clay pit" drains, the North Branch Hoosic River becomes very turbid (field staff observations). This turbidity and greenish hue persists to the confluence with the mainstem Hoosic River.

Suspended Solids

SS samples were collected by DWM at the same location and time as DO described above. Suspended solid concentrations, like turbidity, were elevated in comparison to the other sampling stations in the Hoosic River subwatershed. None of the samples, however, exceeded 25 mg/L (Appendix B, Table B4). Therefore, no impairment was due to suspended solids.

Ammonia-Nitrogen

NH_3-N samples were collected by DWM at the same location and time as DO described above (Appendix B, Table B4). Levels were well below the instream water quality criteria.

Phosphorus

TP samples were collected by DWM at the same location and time as DO described above. Concentrations ranged between 0.018 and 0.06 mg/L (Appendix B, Table B4). There does appear to be some indication of enrichment based on these data, supersaturation and pH. This segment is therefore given an "alert status".

Chemistry –tissue

Bioaccumulation studies associated with the "American Annuity Group, Inc." (former SPELCO/Sprague Electric, Brown Street Facility) waste site investigation #1-0126, included stations in the North Branch Hoosic River (primarily near Henderson Road in Clarksburg). Results of these ongoing investigations (total PCBs in resident Hydropsychid caddisflies) can be summarized as follows: 1993 DEP (1.5 mg/Kg dry weight n=3) (draft QAPP, 1997). EPA collected hydropsychid caddisfly larvae in September 1998 from the Hoosic River near Henderson Road (Nolan 1999). Additional information and guidance are needed to utilize this information in the aquatic life use assessment.

No causes of impairment to the aquatic life use are suspected at this time along the upper 3.0 miles of this segment. The Beaver Mill PCB remediation site is located near the downstream end of this segment. Results of sampling from the North Branch Hoosic River below the Beaver Mill remediation site (located near the USGS gage) are presented in segment MA11-02, North Branch Hoosic River.

FISH CONSUMPTION

Although this use is no longer assessed, no PCBs were detected in the 1997 samples collected by DWM in this segment of the North Branch Hoosic River (Appendix B, Table B7).

PRIMARY CONTACT

Too little data are available to assess this use (Appendix B, Table B5). The North Branch Stream Team 1997 Shoreline Survey Report identifies two potential sources of bacteria, although both are located upstream of the state line in Stamford VT.

SECONDARY CONTACT

Too little data are available to assess this use (Appendix B, Table B5).

AESTHETICS

Based on the visual observations of the field sampling staff, the aesthetic quality of this stream is excellent between the VT State Line and the "seep" at Briggsville (Appendix C). Downstream from this point there is a noticeable increase in turbidity. Since this appears to be a naturally occurring condition, the aesthetics are assessed as full support.

SUMMARY

Overall not enough data exists to determine if this segment meets water quality standards. The North Branch Hoosic River between the VT State Line and Briggsville appears to support the aquatic life use as evidenced by the presence of a balanced assemblage of fishes. No PCBs were detected in the edible portions of fish collected from within this reach in 1997. Downstream of Briggsville, the limited water quality dataset (DO, pH, TP) indicates possible enrichment. Because of these uncertainties, in addition to the Beaver Mill PCB remediation site at the lower end of this segment, the aquatic life use downstream of Briggsville to the USGS gage is not assessed. Although turbidity is present in the reach downstream from Briggsville, it appears to be associated with natural conditions. The entire segment supports the aesthetics use. Historically, elevated levels of pathogens were documented downstream from Briggsville. Although Clarksburg Center has been sewered, too little current data exists to assess either the primary or secondary contact recreational uses. Potential sources of bacteria and nutrients were identified in the North Branch Hoosic River Shoreline Survey Report (1997). The status of each individual use is summarized below.

North Branch Hoosic River (MA11-01) Use Summary Table

Designated Uses		Status	Causes		Sources	
			Known	Suspected	Known	Suspected
Aquatic Life*		Upper 3.0 miles support, lower 1.1 miles not assessed				
Fish Consumption		not assessed				
Primary Contact		not assessed				
Secondary Contact		not assessed				
Aesthetics		4.1 miles support				

* "alert status" issues identified, details in this segment's USE ASSESSMENT section

RECOMMENDATIONS

ADDITIONAL MONITORING

To fully assess the status of each use in this segment:

- Benthic macroinvertebrate sampling and habitat assessments should be conducted within this segment of the North Branch Hoosic River (bracketing major changes in land-use) to document the presence or absence of any detectable impairment to aquatic life.
- Collect diurnal dissolved oxygen and pH measurements at stations bracketing land use activities and at potential sources identified in the 1997 North Branch Stream Team Shoreline Survey Report. These data can be used to determine if water quality standards are being met and to evaluate whether or not high values are related to primary productivity.
- Additional total phosphorus sampling throughout the segment to evaluate potential enrichment.
- Bacteria samples at sites throughout the segment on multiple dates should be collected. Potential sources observed in the 1997 North Branch Hoosic River Shoreline Survey (North Branch Stream Team 1997) include a culvert near the Lane Bridge (Stamford VT) which may convey manure pile runoff, and a year-round rustic camp adjacent to the river (Route 8/100 in VT). It is therefore recommended that a sampling station be located at the VT/MA border to include both wet and dry weather sampling.
- Additional temperature measurements are recommended to determine the frequency and duration of conditions exceeding 20°C. Measurements should bracket major land-use changes. Estimate percentage of stream that is shaded and stream reaches which shading could be increased.
- Continue to monitor the effectiveness of the PCB cleanup activities associated with the Beaver Mill site by conducting additional PCB monitoring including sediments, caddisflies and whole fish samples.

To determine the impacts of discharges:

- Stormwater sampling (pipes) for bacteria and total suspended solids.

To identify sources of impairment/ "alert status":

- Review final report or technical memorandum from EPA on their 1998 Hoosic River sediment and tissue study.
- Establish reasons for extremes in dissolved oxygen measurements.

IMPLEMENTATION

- Review information from the draft *Assessment of Land Use Activities and Nonpoint Source Pollution in the Hoosic River Watershed* (BRPC 1998). This report contains an up-to-date summary of existing and potential nonpoint sources of pollution in the Hoosic River Subbasin. Specifically, one

subwatershed planning area - "North Branch" is relevant to this segment (MA11-01) of the North Branch Hoosic River.

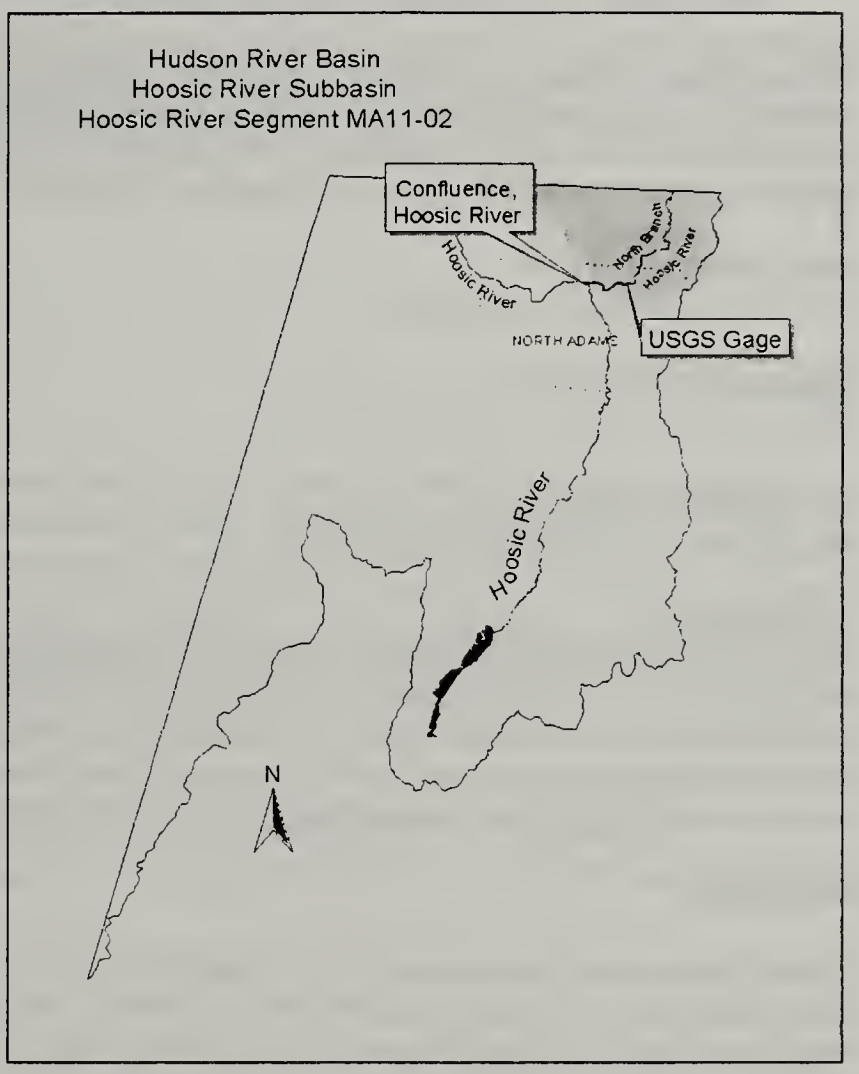
- Locations of pipes into this segment of the river were identified during the 1997 North Branch Hoosic River Shoreline Survey. Determine when these pipes discharge (continuously, wet weather only, etc.). For pipes that discharge conduct total suspended solids and bacterial sampling.

NORTH BRANCH HOOSIC RIVER (SEGMENT MA11-02)

Location: USGS Gage, North Adams to confluence with the Hoosic River, North Adams. Segment Length: 1.5 miles. Classification: Class B, Cold Water Fishery.

SEGMENT DESCRIPTION

Downstream from the USGS gage, the North Branch Hoosic River is impounded by the Eclipse Dam (BCRPC 1987). The dam is located just west of where Routes 2 and 8 split, in an extremely steep sided site (once considered a possible hydroelectric project). The river below the dam is encased in concrete chutes through North Adams to its confluence with the mainstem Hoosic River.



Land-use estimates for the subwatershed contained in Massachusetts (map inset, gray shaded area):

Forest	72%
Residential	13%
Agriculture	6%

Land-use estimates in the 100' buffer from the streambanks:

Residential	25%
Commercial	20%
Industrial	19%

WITHDRAWALS AND DISCHARGES

None known.

USE ASSESSMENT

AQUATIC LIFE

Biology

Habitat quality conditions in this segment of the North Branch Hoosic River where the concrete flood control structures exist (between the dam and the confluence with the mainstem Hoosic River) have been adversely affected. The 1.3 mile reach downstream of the dam, therefore, does not support the aquatic life use as a result of this channelization.

Chemistry –sediment

Results of EPA sampling along this segment of the North Branch Hoosic River (summarized below) conducted in September 1998 (Nolan 1999) are as follows:

- at Rt. 8 Bridge, North Adams— sediment PCBs (0.097 ppm dry weight) were above the L-EL guidelines. When compared to the Provincial Sediment Quality Guidelines, no toxic element concentrations were above levels of concern. The sediment sample was comprised of approximately 71% fine sand (0.075mm), 22% medium sand (0.425mm), and 7% clay and silt (<0.075mm). Neither total organic carbon (TOC), polycyclic aromatic hydrocarbon (PAHs) concentrations (2,095 and 0.48 ppm dry weight, respectively) nor organochlorine pesticides (not detected) were above the L-EL guidelines (Persaud *et. al.*, 1993).

Chemistry –tissue

Bioaccumulation studies associated with the "American Annuity Group, Inc." (former SPELCO/Sprague Electric, Brown Street Facility) waste site investigation #1-0126, included stations in the North Branch Hoosic River (near the USGS gaging station in North Adams). Results

of these ongoing investigations (total PCBs in resident Hydropsychid caddisflies) can be summarized as follows: 1991 DEP (3.40 mg/Kg dry weight n=2), 1993 DEP (3.5 mg/Kg dry weight n=3), and 1996 consultant for American Annuity Group, Inc. Blasland, Bouck & Lee, Inc. (14.7 mg/Kg dry weight) (draft QAPP 1997, attachment 12). EPA collected hydropsychid caddisfly larvae in September 1998 from the North Branch Hoosic River near Routes 2/8 (near the USGS gage) in North Adams (Nolan 1999). Additional information and guidance are needed to utilize this information in the aquatic life use assessment.

Although the 1998 EPA data set has not been formally reported on, a preliminary review of the data are presented. The elevated levels of PCBs in the North Branch Hoosic River sediment sample may impair the aquatic life use. PCB remediation has begun at the Beaver Mill site. The initial site remediation activities were conducted between December 1998 and July 1999.

FISH CONSUMPTION
This use is no longer assessed.

PRIMARY CONTACT
No data are available to assess this use.

SECONDARY CONTACT
No data are available to assess this use.

AESTHETICS
Although the North Branch Stream Team 1997 Shoreline Survey Report noted various types of debris (a shopping cart, a large metal pipe, and tires) in this segment of the North Branch Hoosic River, objectionable deposits were not prevalent. These observations place this segment on an "alert status" for aesthetics. The overriding objection to this segment of the river is that it has been encased in concrete—not an aesthetic issue according to the use assessment guidance but rather an aquatic life issue related to habitat quality.

SUMMARY

Overall not enough data exists to determine if this segment meets water quality standards. PCBs have been detected in the tissue and sediment samples from this segment of the North Branch Hoosic River thus impairing the aquatic life use. PCB cleanup work began at the Beaver Mill in 1998. Physical alteration (flood control structures) of the streambed and banks has resulted in a reduction of habitat available for aquatic life thus impairing the aquatic life use downstream from the Eclipse Dam. The presence of anthropogenic debris in the channel places the aesthetic use on "alert status". The status of each individual use is summarized below.

North Branch Hoosic River (MA11-02) Use Summary Table

Uses	Designated	Status	Causes		Sources	
			Known	Suspected	Known	Suspected
Aquatic Life		Upper 0.2 miles not assessed, lower 1.3 miles non support	PCBs , habitat alteration,		Channelization, Contaminated sediments, hazardous waste site	
Fish Consumption		not assessed				
Primary Contact		not assessed				
Secondary Contact		not assessed				
Aesthetics *		not assessed				

* "alert status" issues identified, details in this segment's USE ASSESSMENT section

RECOMMENDATIONS

ADDITIONAL MONITORING

To fully assess the status of each use in this segment:

- Bacteria samples upstream of the dam and at the downstream end of the segment on multiple dates should be collected.
- Continue to monitor the effectiveness of the PCB cleanup activities associated with the Beaver Mill site by conducting additional PCB monitoring including sediments, caddisflies and whole fish samples.
- Review final report or technical memorandum from EPA on their 1998 Hoosic River sediment and tissue study.

To determine the impacts of discharges:

- Stormwater sampling (pipes) for bacteria.

IMPLEMENTATION

Non point source

- Review information from the draft *Assessment of Land Use Activities and Nonpoint Source Pollution in the Hoosic River Watershed* (BRPC 1998). This report contains an up-to –date summary of existing and potential nonpoint sources of pollution in the Hoosic River Subbasin. Specifically, one subwatershed planning area – "Main Stem" is relevant to this segment (MA11-02) of the North Branch Hoosic River. Determine if any problems identified in the BRPC report warrant further investigation (water quality monitoring, etc.) and/or remediation (streambank stabilization, etc).

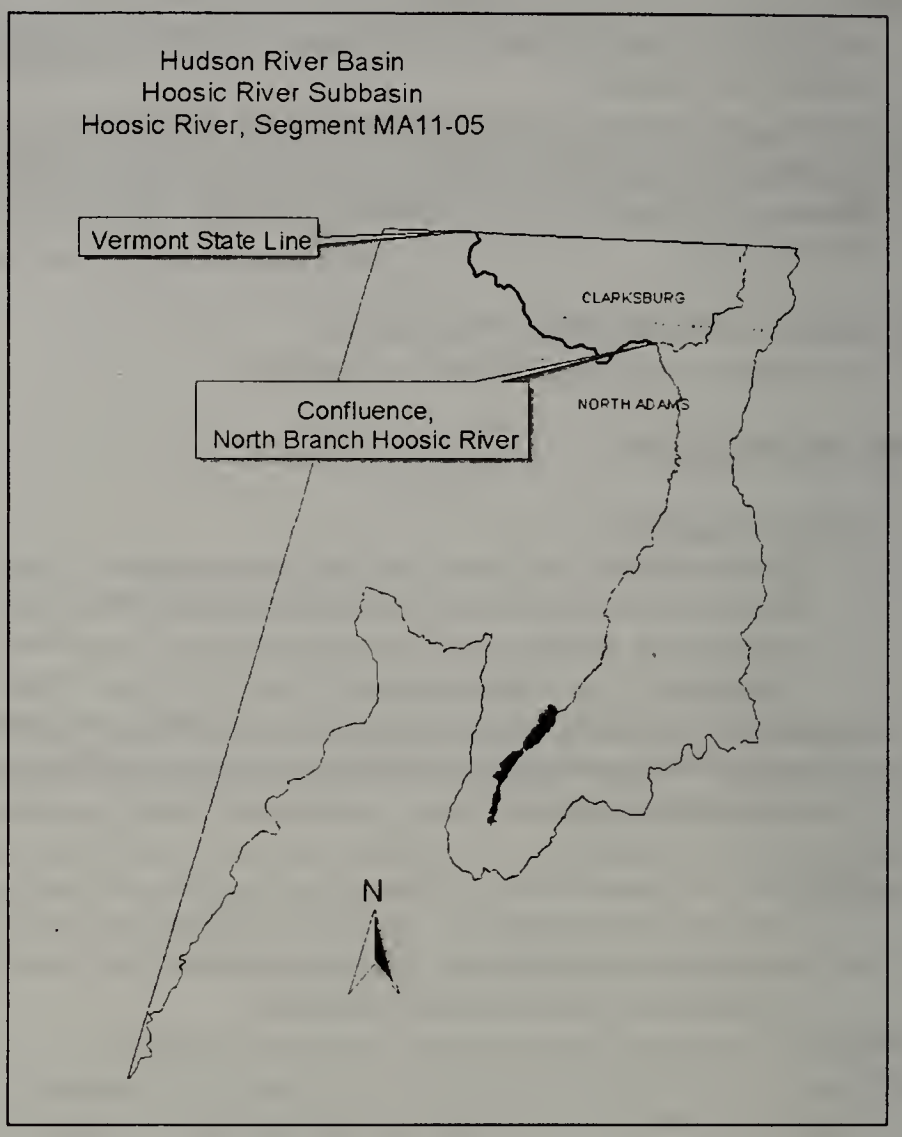
Other

- Remove auto debris from the Hoosic River and bank near Hunter Foundry Bridge.
- Investigate possible ways to increase habitat for aquatic life in the sections of this segment that are impacted by the flood control chutes.

HOOSIC RIVER (SEGMENT MA11-05)

Location: Confluence with the North Branch Hoosic River, North Adams to the Vermont State Line, Williamstown. Segment Length: 8.3 miles. Classification: Class B, Warm Water Fishery.

SEGMENT DESCRIPTION



This segment of the Hoosic River flows in a generally west then northwesterly direction around the south and southwest slopes of East Mountain (Clarksburg, North Adams and Williamstown). Two tributaries, Sherman and Broad brooks drain south, discharging into the mainstem. Notch and Paull brooks (draining Notch and Mount Williams Reservoirs, respectively) both flow generally north draining two peaks in the Greylock Range - Williams and Prospect Mts. Flowing between the Greylock and Taconic Ranges, the Green River (the mainstem's major tributary) joins the Hoosic River just downstream of Williamstown proper. Hemlock Brook is the last tributary draining the Taconics that discharges into the Hoosic River just downstream of Route 7 in Williamstown. This segment ends where the Hoosic River enters Vermont.

At the upstream end of this segment, the Hoosic River is channelized by the concrete flood control structures (approximately 0.2 miles in length). The river then passes Commonwealth Sprague Capacitor, Inc. (formerly Sprague Electric Company). Here the river receives cooling water from this facility. Contaminants present at this site include PCBs and VOCs (currently under remediation as part of waste site cleanup #1-0126). The river flows under the Boston and Maine Railroad, then crosses Route 2 twice as it loops south. The railroad runs along the north bank of the Hoosic River for the majority of its length. A roll dam is present just upstream of the site of the old North Adams WWTP which has been dismantled. The Widen Tannery site is located on the north side of the river just upstream of Ashton Ave in North Adams. A USGS gaging station (01332500) is located in Williamstown near the North Adams border. At this point the river is flowing primarily northwest and is bordered by a section of cropland and forests, receives the flow from the Green River and then passes north of Williamstown proper. The river flows past the Williams College playing fields, passes under Route 7, and receives the treated discharge from the Hoosac Water Quality District wastewater treatment plant just upstream of its confluence with Hemlock Brook. Downstream from here the river is bordered by forests to the west while the eastern bank is bordered by a gravel pit (and town dump) and a small industrial complex in the vicinity of Broad Brook. After passing a farm, the Hoosic River leaves Massachusetts and enters Pownal, VT at the end of this segment.

Land-use estimates in the Massachusetts portion of the subwatershed*

Forest	73%
Agriculture	13%
Residential	7%

* drainage area estimated

Land-use estimates in the 100' buffer from the streambanks:

Forest	33%
Open Land	12%
Residential	9%

WITHDRAWALS AND DISCHARGES

WMA:

1. WMA Reg# 1-01-209.01 –North Adams Water Department. The town is registered for 2.8 MGD from 5 sources. The Greylock Well (PWS #1209000-01G) is located along this segment of the mainstem Hoosic River. The well has been (or will be upgraded) to withdraw from 1.4 to 2.4 MGD. Another source for the North Adams Water Department is Notch Reservoir (PWS # 1209000-01S) which is located on Notch Brook, a tributary of the Hoosic River not assessed in this report. In 1998, the North Adams Water Department used 2.693 MGD.
2. WMA Reg# 1-01-341.01 and Permit #9P3-1-01-341.04 – Williamstown Water Department. The town is registered/permitted for 0.9 MGD from two wells and two surface water sources. Their two surface water sources are no longer in use (emergency use only). There are now three wells (PWS # 1341000-01G, 02G, and 03G), located along the lower Hoosic River (north of the center of Williamstown). Well #03 went on-line in 1998. Their 1997 use was reported to be 0.88 MGD.
3. Steinerfilm, Inc. Reg#1-01-341.02 for 0.82 MGD and Permit #9P-1-01-341.03 from three wells for 0.54 MGD for a total withdrawal of 1.36 MGD. In 1998 their actual use was 0.613 MGD.

NPDES:

1. MA0005924 issued February 1977 to Sprague Electric Company was transferred to the Commonwealth Sprague Capacitor, Inc., North Adams in June 1995. The original permit expired five years from issuance date; however the conditions of this permit will continue in force until the new permit is issued. The company is authorized to discharge via one Outfall (#001) a daily average of 0.475 MGD at a daily maximum temperature of 28°C (83°F). The permit also contains a PCB limit (12 g/day daily average, and a daily maximum concentration limit of 0.010 mg/L). If the facility demonstrated that PCBs existed in the intake waters, the data could be used in a compliance evaluation. The permit also states that "In no case shall any the PCB limit be achieved by dilution".
2. MA0100510 issued September 1989 to the Hoosac Water Quality District Wastewater Treatment Plant is authorized to discharge via outfall #001 5.37 MGD of treated wastewater to the Hoosic River. The permit limits for whole effluent toxicity are $LC_{50} \geq 100\%$ and $CNOEC \geq 13\%$ effluent. The permit was modified in May 1993 reducing the toxicity testing requirements to only one test organism (*C. dubia*). The facility utilizes chlorine for disinfection and has upgraded to seasonal dechlorination (1 April and 15 October) to meet the daily maximum TRC permit limit of 0.15 mg/L.
3. MA0027499 issued September 1981 to Chadbourne International, Inc. Permit indicates discharge via outfall #001 0.994 MGD of non-contact cooling water to Hoosic River. Temperature was limited to 24°C (75°F) daily maximum. This company merged with Steinerfilm, Inc. in 1987. Water for the company was apparently from a well. If it still exists, they may need a WMA permit. Note: Berkshire Regional Planning Commission still indicates Chadbourne is an active NCCW discharge.

Other:

1. EPA issued an NPDES permit exclusion to the AAG, Inc. Brown Street Plant in North Adams. The exclusion was authorized in July 1994 for a groundwater recovery and treatment system discharging up to 70 gal/minute to the Hoosic River for a period of six weeks. Determine if this discharge needs to be part of the Commonwealth Sprague Capacitor, Inc NPDES permit.
2. DEP site inspection in May 1992 for MA005959 General Photo Products Co. in Williamstown (a.k.a. Phototech Imaging Systems?). Site was abandoned and all traces of company were gone. The WMA Permit #9P-1-01-341.02 for 0.33 MGD is also closed out.

3. MA0026638 Steinerfilm, Inc. issued May 1978. Discharge of 0.02 MGD of non-contact cooling water via outfall #001 to Broad Brook. Daily maximum temperature limit of 70°F. Compliance inspection report (October 1988) indicated discharge of 0.81 MGD of non-contact cooling water was to the Hoosic River. Need to determine outfall location.

USE ASSESSMENT

AQUATIC LIFE

Biology

The 1997 DWM RBPIII survey was conducted approximately 230 m upstream and 550 m downstream of the Hoosac Water Quality District WWTP discharge (stations HR03 and HR02, respectively) (Appendix C). The data collected from these stations were compared to the regional reference station (GE01) on the East Branch Green River. The RBPIII analysis indicated 58% comparability (slight impacts) for the Hoosic River upstream of the discharge and 50% comparability (moderate impacts) for the Hoosic River downstream of the WWTP discharge. However when the downstream station was compared against the upstream station, no impairment was detected. Because of the degree of impairment detected, the aquatic life use is assessed as partial support.

Habitat quality conditions in the Hoosic River where the concrete flood control structures/riprap streambed exist (from the confluence with the North Branch Hoosic River to just north of the rear parking lot of the American Annuity Group, Inc. Brown Street Plant) have been adversely affected. This 0.2-mile reach therefore does not support the aquatic life use as a result of this channelization.

Collection of fish from one station (just upstream from the inflow of Notch Brook) in this segment of the Hoosic River was conducted by DWM in 1997(Appendix B, Table B7). Species included eastern brook trout and brown trout.

In 1976 DFWELE (Project No. F-36-R-8) conducted fish population surveys at two stations along this reach of the Hoosic River-- downstream from the old North Adams WWTP behind Widen Tannery and upstream of the confluence with Broad Brook (MA DEP 1997a, Attachment 1). Sampling efficiency was restricted due to stream width. Behind the tannery the river was turbid. Seven species of fish were collected including white sucker (dominant), longnose sucker, bluegill, longnose and blacknose dace, golden and common shiner. No trout were seen or collected. Abundant and common finfish collected from the Hoosic River upstream of Broad Brook included white sucker, blacknose and longnose dace, brown trout, bluegill. Other species encountered included goldfish, largemouth bass, common shiner and creek chub.

Quantity

The Hudson River Basin Plan Volumes I, II, and III (DEM 1989a, 1989b, and 1989c) determined that this reach of the Hoosic River is not stressed due to water withdrawal practices. One industrial user is projected to increase their average withdrawal from 0.8 MGD (0.3 MGD consumptive use) to 2.3 MGD (0.9 MGD consumptive use). Streamflow measurements (DWM 1997 survey) west of Rte 7 in Williamstown were not less than 66 cfs (Appendix B, Table B2). There are no major concerns related to water quantity in this segment of the Hoosic River at this time.

Toxicity

The Hoosac Water Quality District WWTP has collected and used Hoosic River water from this segment as dilution water for use in their whole effluent toxicity tests. Between 1993 and May 1999, survival of *Ceriodaphnia dubia* exposed (7-day) to the river water has not been less than 90% (Dallaire 1999b). With the exception of the May 1993 test event, no acute toxicity has been detected in the effluent. No exceedences of the CNOEC limit have been reported either.

Chemistry - water

DO

Dissolved oxygen was measured at two locations DWM (HR03 - near the Route 7 Bridge, Williamstown and HR02 – approximately 0.3 miles upstream of the state line) on three occasions in 1997 (Appendix B, Table B3). DO was not less than 8.2 mg/L although supersaturation (105-

118%) did occur. Due to the small data set, limited sample sites and the lack of pre-dawn oxygen readings, the dissolved oxygen dynamics are not well documented. This segment is therefore given an "alert status".

Temperature

Temperature was measured at the same station and dates as DO described above. The maximum temperature was 22.9°C (Appendix B, Table B3).

pH

pH was measured at the same station and dates as DO described above. All pH measurements were above 8.0 SU (Appendix B, Table B3). While these high values may indicate increased primary productivity, pHs in this range are also likely to be found in a carbonate-based watershed.

Turbidity

A very limited data set was collected by DWM in 1997 (Appendix B, Table B4). No problems were indicated.

Suspended Solids

SS samples were collected by DWM at the same location and dates as DO described above. None of the samples exceeded 25 mg/L (Appendix B, Table B4). Therefore, no impairment was due to suspended solids.

Ammonia-Nitrogen

NH_3-N samples were collected by DWM at the same location and dates as DO described above (Appendix B, Table B4). Levels were well below the instream water quality criteria.

Phosphorus

TP samples were collected by DWM at the same location and dates as DO described above. Concentrations ranged between 0.018 and 0.074 mg/L. There does appear to be some indication of enrichment based on these data (Appendix B, Table B4). This segment is therefore given an "alert status".

Total Residual Chlorine

TRC measurements were reported in the Hoosac Water Quality District WWTP toxicity testing reports. The highest effluent TRC measurement was 0.9 mg/L (August 1993), however none of the other measurements exceeded the permit limit of 0.15 mg/L (Dallaire 1999b). Document when dechlorination was implemented. There are no concerns related to TRC in this reach of the Hoosic River at this time.

Chemistry –sediment

Results of EPA sampling along this segment of the Hoosic River (summarized below) conducted in September 1998 (Nolan 1999) are as follows:

- Downstream of the Fairgrounds fill site (at the roll dam downstream from the Brown Street Facility), North Adams— sediment PCBs (0.61 ppm dry weight) exceeded the L-EL guideline. Copper, lead, nickel, and zinc were all elevated (30.0, 42.2, 19.2, and 164 ppm dry weight respectively) and above their respective L-EL Provincial Sediment Quality Guidelines (Persaud *et. al.*, 1993). The sediment sample was comprised of approximately 77% fine sand (0.075mm) and 15% silt and clay. The concentration of total organic carbon (TOC), polycyclic aromatic hydrocarbon (PAHs) and total DDT (38,972, 10.6, and 0.0079 ppm dry weight, respectively) were also above the L-EL guidelines (Persaud *et. al.*, 1993).
- Old Adams POTW, upstream of dam – the average sediment PCB concentration (0.32 ppm dry weight) exceeded the L-EL guideline. When compared to the Provincial Sediment Quality Guidelines, copper (17.2 ppm dry weight) slightly exceeded the L-EL. The sediment sample was comprised of approximately 65% fine sand (0.075mm) and 34% silt and clay. Both total organic carbon (TOC) and polycyclic aromatic hydrocarbon (PAHs) average concentrations (21,968 and 5.5 ppm dry weight, respectively) were above the L-EL guidelines (Persaud *et. al.*, 1993). The average total DDT concentration (0.064 ppm dry weight) was below the L-EL guideline.
- An additional station was sampled near the Pownal Tannery dam in Pownal, VT.

Chemistry –tissue

Bioaccumulation studies associated with the AAG, Inc. (former SPELCO/Sprague Electric, Brown Street Facility) waste site investigation #1-0126, included stations in the Hoosic River bracketing the

Brown Street Facility. Results of these investigations as reported by Blasland, Bouck, and Lee (1998) are summarized as follows:

	Hydropsychid Caddisfly tissue		Caged Minnow tissue mg/Kg wet weight	
Sample Date	Average [PCB] Upstream SEC	Average [PCB] Downstream SEC	Average [PCB] Upstream SEC	Average [PCB] Downstream SEC
1996	1.4/6.7*	0.94/4.3*	0.41	0.83
1997	1.5/6.8*	1.4/6.2*	0.59	1.4

*Units reported in mg/Kg wet weight/dry weight

EPA collected hydropsychid caddisfly larvae in September 1998 from the Hoosic River near the fairgrounds in North Adams and near the state line in Williamstown (Nolan 1999). Additional information and guidance are needed to utilize this information in the aquatic life use assessment.

Although the 1998 EPA data set has not been formally reported on, a review of the sediment data corroborates the findings of the benthic impact analysis. The elevated levels of PCBs in tissue and sediment samples as well as slightly elevated concentrations of Cu, Pb, Ni, Zn, TOC, PAHs, and total DDT in the Hoosic River sediments (suspected causes), may cause impairment of the aquatic life use.

FISH CONSUMPTION

In 1994 the MDPH updated their fish consumption advisory for the Hoosic River. The advisory recommends that people should refrain from eating all fish from the Hoosic River caught below the channelized section in North Adams to the state line. Because of this fish consumption advisory, the lower 8.1mile reach of this segment does not support this use due to PCB contamination. PCBs were detected (Appendix B, Table B7) in the 1997 samples collected by DWM in this segment of the Hoosic River.

PRIMARY CONTACT

Too little data are available to assess this use (Appendix B, Table B5).

SECONDARY CONTACT

Too little data are available to assess this use (Appendix B, Table B5).

AESTHETICS

The upper 4.9 miles are not assessed at this time. Although limited data is available to assess this use, based on the visual observations of the field sampling staff, the aesthetic quality of this stream is supported for the lower 3.4 miles (Appendix C). The south bank of the river adjacent to Williams College playing fields (Coles Field) is littered with debris including old rusted cars, and white goods. The extent of this debris is unknown (probably localized) and placed the immediate area on "alert status". An objectionable condition (concrete channel) is not an aesthetic issue according to the use assessment guidance but rather an aquatic life issue related to habitat quality.

SUMMARY

Physical alteration (flood control structures) of the streambed and banks has resulted in a reduction of habitat available for aquatic life thus impairing the aquatic life use at the upper end of this segment. The aquatic life use is assessed as partial support throughout the segment due to unknown upstream sources of pollution. PCB contamination is present throughout the entire segment resulting from the Beaver Mill Site on the North Branch Hoosic River and the Brown Street Facility on the Hoosic River (at the upper end of this segment). PCBs have been detected in the biota (Hydropsychid caddisflies and fish) and sediment. The MDPH advisory recommends that people should refrain from eating all fish from the Hoosic River caught below the channelized section in North Adams to the state line. Because of this advisory, the fish consumption use is not supported. There are also some indications of enrichment downstream of the Hoosac Water Quality District discharge in the Hoosic River. The status of each individual use is summarized below.

Hoosic River (MA11-05) Use Summary Table

Designated Uses		Status	Causes		Sources	
			Known	Suspected	Known	Suspected
Aquatic Life*		Upper 0.2 miles non support, lower 8.1 miles partial support	Habitat alteration	Unknown, PCBs, metals, PAHs, Nutrients	Channelization, contaminated sediments , hazardous waste sites, WWTP	Urban runoff, Unknown
Fish Consumption		Upper 0.2 miles not assessed, lower 8.1 miles non support	PCBs		Brown Street Facility Hazardous Waste Site	
Primary Contact		not assessed				
Secondary Contact		not assessed				
Aesthetics*		Upper 4.9 miles not assessed, lower 3.9 miles support				

* "alert status" issues identified, details in this segment's USE ASSESSMENT section

RECOMMENDATIONS

ADDITIONAL MONITORING

To fully assess the status of each use in this segment:

- Bacteria samples at sites throughout the segment on multiple dates and under various weather conditions should be collected. Hoosic River Watershed Association conducts rafting trips through this section of the Hoosic River. Bacteria monitoring is suggested to assess the *secondary contact* use.
- Determine the extent of the area impacted by the old dump between Cole Field and the River.

To identify sources and/or extent of impairment/ "alert status":

- Review final report or technical memorandum from EPA on their 1998 Hoosic River sediment and tissue study.
- Additional benthic sampling along the river to determine the extent of impairment.
- Stream walk to identify possible sources of: erosion, NPS runoff, undocumented discharges.
- Conduct appropriate monitoring at possible sources established during stream walk.
- Investigate bright orange leachate coming from an old landfill (currently occupied by DPW Williamstown lot), west of Simonds Rd (Rte. 7).

IMPLEMENTATION

Point source

- Continue to monitor the progress of the hazardous waste (PCB) site clean-up activities. Determine whether or not an NPDES permit will be required for the AAG Brown Street Plant groundwater recovery and treatment system discharge.
- The Hoosac Water Quality District WWTP NPDES permit needs to be reissued. Based on the review of their toxicity testing reports the following variables could be eliminated from their toxicity testing requirements: Ag, Cd, Cr, Fe, Cyanide and Phenols. Nutrient monitoring (nitrogen series and total phosphorus) should be added to the permit. Document when seasonal dechlorination was implemented.
- Identify any discharges that are currently unpermitted. In addition to these facilities (if any) conduct site visits to all NPDES permittees.
- Determine whether or not Outfall #001 (Chadbourne International, Inc.) is still active as part of the Steinerfilm Inc. merger.

Non point source

- Review information from the draft *Assessment of Land Use Activities and Nonpoint Source Pollution in the Hoosic River Watershed* (BRPC 1998). This report contains an up-to –date summary of existing and potential nonpoint sources of pollution in the Hoosic River Subbasin. Specifically, two subwatershed planning areas – "Main Stem" and "Hemlock Brook" are relevant to this segment (MA11-05) of the Hoosic River. Determine if any problems identified in the BRPC report warrant further investigation (water quality monitoring, etc.) and/or remediation (streambank stabilization, etc).

Other

- Investigate possible ways to increase habitat for aquatic life in the sections of this segment that are impacted by the flood control chutes.

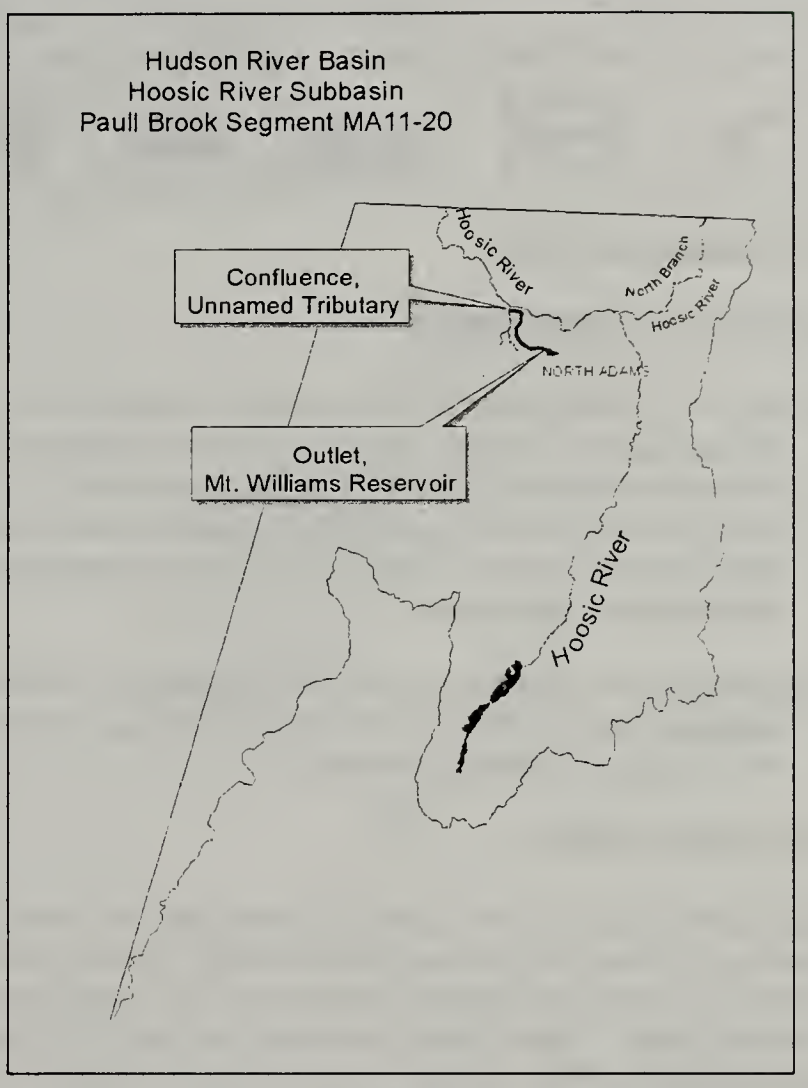
PAULL BROOK (SEGMENT MA11-20)

Location: Outlet of Mt. Williams Reservoir, North Adams to confluence with unnamed tributary, Williamstown. Segment Length: 2.0 miles. Classification: Class B, High Quality Water.

SEGMENT DESCRIPTION

This segment of Paull Brook flows in a northwesterly direction from the outlet of Mt. Williams Reservoir in North Adams to its confluence with an unnamed tributary in Williamstown. This tributary then flows into the Hoosic River in Williamstown just downstream from the North Adams border.

From the outlet of Mt. Williams Reservoir, Paull Brook flows down a steep gradient through forest and cropland. The brook then passes under the Harriman Airport in North Adams, continues north flowing under Route 2 where it turns west and runs along a medium density neighborhood to its confluence with the unnamed tributary.



Land-use estimates for the subwatershed*:

Forest	56%
Agriculture	16%
Residential	12%

*drainage area estimated

Land-use estimates in the 100' buffer:

Forest	31%
Wetlands	29%
Residential	23%

WITHDRAWALS AND DISCHARGES

WMA:

1. WMA Reg# 1-01-209.01 –North Adams Water Department. The city is registered for 2.8 MGD from 5 sources. Mt. Williams Reservoir (PWS#1209000-04S) is one of their main sources. A water treatment facility has been constructed as part of the Surface Water Treatment Rule.
2. WMA Reg# 1-01-341.01 – Williamstown Water Department. The town is registered for 0.9 MGD from two wells and two surface water sources. Both of these surface water sources (1341000-02S and 03S—Sherman Springs Reservoir) are currently off-line (available for emergency use).

Stormwater Permits:

1. MAR05A616, MAR05A61, MAR05A619 –Harriman Airport.

USE ASSESSMENT

Overall, no current data were available to determine if this segment meets water quality standards.

SUMMARY

All designated uses (below) in Paull Brook are not assessed at this time.

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
				

RECOMMENDATIONS

ADDITIONAL MONITORING

To fully assess the status of each use in this segment:

- Stream walk to identify possible sources of: erosion, NPS runoff (below the water supply intake at Mt. Williams Reservoir), undocumented discharges.
- Conduct appropriate monitoring at possible sources established during stream walk.
- Determine if impacts are associated with water withdrawals. If impacts are identified institute water conservation measures.

To identify sources and/or extent of impairment/ "alert status":

- Although the Harriman is a miner airport, stormwater runoff controls should be evaluated. Determine need for any additional monitoring.

IMPLEMENTATION

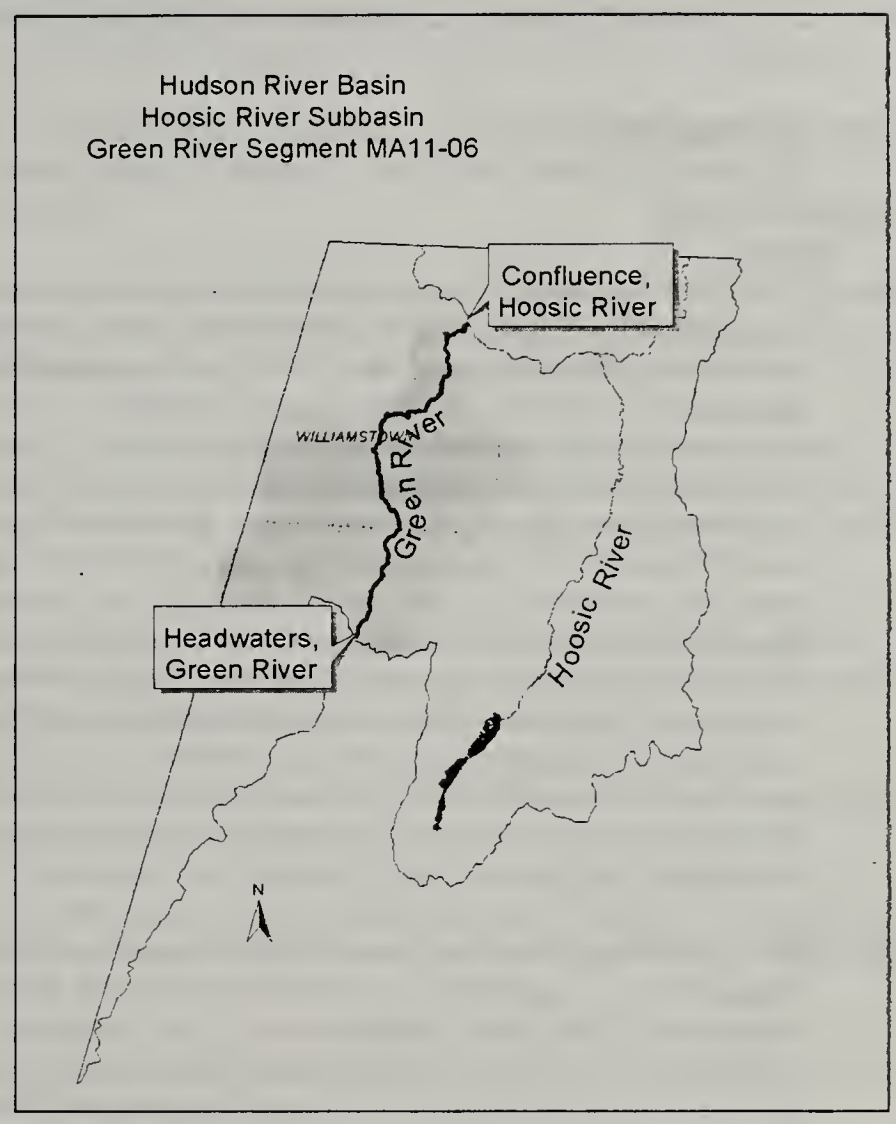
Review information from the draft *Assessment of Land Use Activities and Nonpoint Source Pollution in the Hoosic River Watershed* (BRPC 1998). This report contains an up-to-date summary of existing and potential nonpoint sources of pollution in the Hoosic River Subbasin. Specifically, one subwatershed planning area – "Main Stem" is relevant to Paull Brook, segment (MA11-20). Determine if any problems identified in the BRPC report warrant further investigation (water quality monitoring, etc.) and/or remediation (streambank stabilization, etc).

GREEN RIVER (SEGMENT MA11-06)

Location: Headwaters, southwest slope of Sugarloaf Mt. West of Ingraham Road, New Ashford to confluence with the Hoosic River, Williamstown. Segment Length: 10.8 miles. Classification: Class B, Cold Water Fishery.

SEGMENT DESCRIPTION

The headwaters of the Green River originate southwest of Sugarloaf Mountain west of Ingraham Road in New Ashford. The river flows north towards the center of New Ashford. Just upstream of Route 7, it receives flow from an unnamed tributary. The Green River continues to flow in a northerly direction, crossing back and forth under Route 7. Two tributaries, Thompson Brook and the East Branch Green River join the mainstem southeast of Brodie Mt. It receives the flow from Roaring Brook (draining the northwestern slope of Saddle Ball Mountain). The Green River continues north into South Williamstown and is joined by the West Branch Green River. It loops towards the east following Green River Road and at Sweets Corner, receives the flow from Hopper Brook. After crossing under Blair Road, the river receives flow from two additional unnamed tributaries. It continues to flow north towards the center of Williamstown passing a golf course then an industrial complex. The river turns sharply east then passes the USGS gaging station (01333000), under Route 2 and on to its confluence with the Hoosic River.



Land-use estimates for the subwatershed* (map inset, gray shaded area):

Forest	69%
Agriculture	20%
Open Land and Residential	5% each

*drainage area estimated

Land-use estimates in the 100' buffer:

Forest	63%
Agriculture	21%
Residential	10%

WITHDRAWALS AND DISCHARGES

Community Public Water Supply systems (withdrawal less than 0.10 MGD)

1. PWS # 1341004-01G. Waubeeka Springs
2. PWS # 1341003-02G. 03G. 04G and 05G. Sweet Brook and Sweet Wood Care Centers

NPDES:

1. MA0022233 issued May 1977. TP and Four, Inc. assumed ownership in September 1998 (formerly The Springs, Inc.) and is authorized to discharge via outfall #001 0.006 MGD of treatment plant effluent to the Green River. The maximum daily permit limit for total residual chlorine is 2.0 mg/L.

2. MA0025909 issued March 1977 to the Mill on the Floss Restaurant. Notes indicate that permit has expired and there is no longer a discharge.
3. MA0100323 Mount Greylock Regional High School discharge to the Green River was eliminated when town sewer was installed (Hoosac Water Quality District wastewater treatment plant).
4. MA0005975 issued January 1987. General Cable Company (formerly Carol Cable Company). The facility installed a closed –loop system in 1988. Only two stormwater outfalls, 001 and 006, remain active.

USE ASSESSMENT

AQUATIC LIFE

Biology

The 1997 DWM RBPIII survey was conducted at four stations along the mainstem Green River (Appendix C) – downstream from the Mill-on-the-Floss Restaurant in New Ashford (GN04), upstream from Route 43 in Williamstown (GN03), downstream from Blair Road in Williamstown (GN02) and upstream from Route 2 in Williamstown (GN01). The data collected from these stations were compared to the regional reference station (GE01) on the East Branch Green River. The RBPIII analysis at the upstream station (GN04) indicated 75% comparability to the reference station. Instream habitat quality was excellent. The RPBIII analysis for the Green River at GN03 and GN02 was 58% and 54%, respectively as compared to the regional reference station. Agricultural practices most likely contributed to the slight impairment. The most downstream station on the Green River (GN01) was only 50% comparable to the reference station. The moderate impairment determination most likely resulted from the cumulative effects of upstream loadings and ineffective stormwater management practices in the vicinity of the Williamstown Municipal Garage. This garage was closed (relocated to the Hoosac Water Quality District treatment plant area) in 1998. Failing septic systems and/or direct discharges to an unnamed tributary (locally known as Christmas Brook) that enters the Green River just upstream of the GN01 have also been ordered to eliminate their discharges (tight tanks) until a sewer line is installed.

The DWM fish population survey (RBPV) was conducted in 1997 along the following reaches of the Green River — upstream and downstream of the Mill on the Floss Restaurant (New Ashford), upstream of Blair Road (Williamstown), and upstream of Route 2 (adjacent to East Lawn Cemetery in Williamstown). The two reaches sampled near the Mill on the Floss Restaurant were separated by a dry impoundment with a dam and a waterfall. The upstream location contained slimy sculpin, brown and brook trout (including young-of-the-year) and one longnose sucker (Appendix B, Table B6). All species present were intolerant of degraded habitat and low dissolved oxygen conditions. The downstream location contained a large number of slimy sculpin. In addition blacknose dace, brook and brown trout were collected. Young-of-the-year brook and brown trout were also numerous at this location. The presence of a dam and waterfall between these two stations serve as a barrier to migration which limits upstream migration of fishes while allowing for downstream migrants. These barriers may be contributing to the presence of a more abundant total fish population at the downstream location. Downstream from this location, electroshocking efficiency was limited due to the width and/or depth of the Green River. The stream reach sampled near Blair Road was mostly open (10% shaded) and dominant fish cover was in the form of rocks. Fish collected in order of abundance included longnose dace, slimy sculpin, blacknose dace, brown trout, and white sucker. Fish density was high and the assemblage included three cold water pollution intolerant species. Upstream of Route 2, the reach included deep pools and run habitat with stable cover in the form of ledge, rocks, and boulders. The reach was fairly open (20% shaded). Fish collected in order of abundance included longnose dace, blacknose dace, brown trout (including young-of-the-year), white sucker, longnose sucker, and slimy sculpin. Fish density was high and the assemblage included four cold water pollution intolerant species.

These results are similar to the findings of the 1976 DFWELE survey (MA DEP 1997a, Attachment 1).

Chemistry - water

DO

Dissolved oxygen was measured at one station by DWM (GN01- Green River, upstream of Route 2 Bridge, Williamstown) on three occasions in 1997 (Appendix B, Table B3). DO was not less than 9.4 mg/L although supersaturation (as high as 105%) did occur. Due to the small data set, limited sample sites and the lack of pre-dawn oxygen readings, the dissolved oxygen dynamics are not well documented. This segment is therefore given an "alert status".

Temperature

Temperature was measured at the same station and dates as DO described above. No measurements exceeded the cold water fishery standard of 20°C (Appendix B, Table B3). Temperature is not a concern at this time.

pH

pH was measured at the same stations and dates as DO described above. pH ranged between 8.3 and 8.5 SU (Appendix B, Table B3). While these high values may indicate increased primary productivity, pHs in this range are also likely to be found in a carbonate-based watershed.

Turbidity

A very limited data set was collected by DWM in 1997. One instream turbidity measurement (Appendix B, Table B3) was taken (17 NTU). Laboratory turbidity measurements were all low (Appendix B, Table B4). Observations of turbidity appear to be associated with natural conditions (clay) giving the river a "green" hue.

Suspended Solids

SS samples were collected by DWM at the same location and dates as DO described above (Appendix B, Table B4). Suspended solid concentrations were all below detection (< 2.5 mg/L). The dataset does not indicate impairment due to suspended solids.

Ammonia-Nitrogen

NH_3-N samples were collected by DWM at the same location and dates as DO described above (Appendix B, Table B4). Levels were well below detection.

Phosphorus

TP samples were collected by DWM at the same location and dates as DO described above. Concentrations were the lowest measured in the Hoosic River Subbasin (Appendix B, Table B4).

FISH CONSUMPTION

This use is no longer assessed (see Use Assessment Methods and Appendix D).

PRIMARY CONTACT

Bacteria

Agricultural activities adjacent to the Green River however are likely sources of bacteria contamination. As described in Appendix C (see results and discussion for GN03), field-sampling staff observed cows in the river. Discussion of the 1998 Green River Fecal Coliform Monitoring Project by the Hoosic River Watershed Association (Riggs 1998) indicated that management practices (fencing to prevent farm animals from direct access to the river) had been instituted by at least one farm. Too little data, however, are available to assess this use.

SECONDARY CONTACT

Too little data are available to assess this use (Appendix B, Table B5).

AESTHETICS

Although limited data is available to assess this use, based on the visual observations of the field sampling staff, the aesthetic quality of this stream is generally excellent. Two areas, in close proximity to the farm near Route 43 and the lower reach of the Green River as it flows around downtown Williamstown, suffer from sedimentation. Localized areas of trash and debris were also noted on the steep banks upstream of Route 2 (Appendix C) and places this immediate area on "alert status".

SUMMARY

Overall not enough data exists to determine if this segment meets water quality standards. While supporting cold water, pollution intolerant fishes, the aquatic life in the Green River is slightly impaired

when compared to the regional reference throughout most of its length. Moderate impairment was detected (likely a result of the cumulative effects from upstream loadings as well as poor stormwater management practices at the Williamstown municipal garage and failing septic system discharges) in the lower mile of the segment. Not enough water quality data was collected to determine potential causes of impairment. A symptom of enrichment (supersaturation) was measured at the downstream end of this segment. Although there are localized areas of sedimentation and trash/debris, this segment supports the aesthetics use. The status of each individual use is summarized below.

Green River (MA11-06) Use Summary Table

Designated Uses		Status	Causes		Sources	
			Known	Suspected	Known	Suspected
Aquatic Life*		Upper 9.8 miles partial support, lower 1.0 mile non support		Organic enrichment	Failing septic systems, Urban runoff /storm sewers	Agriculture
Fish Consumption		not assessed				
Primary Contact		not assessed				
Secondary Contact		not assessed				
Aesthetics*		10.8 miles support				

* "alert status" issues identified, details in this segment's USE ASSESSMENT section

RECOMMENDATIONS

ADDITIONAL MONITORING

To fully assess the status of each use in this segment:

- Dissolved oxygen measurements need to be taken at additional sites at worse case (early morning, low flow) scenario times to determine current conditions.
- Turbidity monitoring to characterize any erosional impacts from existing land use practices.
- Additional nutrient sampling throughout the segment to determine current conditions (phosphorus and Nitrogen series).
- Bacteria samples at sites throughout the segment bracketing changes in land-use and agricultural properties on multiple dates should be collected to establish current conditions.

To identify sources of impairment/ "alert status":

- Stream walk to identify possible sources of: erosion, NPS runoff, undocumented discharges.
- Conduct appropriate monitoring at possible sources established during stream walk.

IMPLEMENTATION

Point Source

- Stormwater mitigation plan should be developed and implemented for the Williamstown Municipal Garage property (Garage has been relocated).
- Evaluate the effectiveness of the General Cable Company (formerly Carol Cable Company) stormwater controls. Update their NPDES permit for outfalls 001 and 006. Determine if they are eligible for a general stormwater permit.
- Update/reissue the NPDES permit for TP& Four, Inc. with appropriate limits.
- Mill-on-the-Floss Restaurant in New Ashford NPDES permit file should be reviewed and closed out.
- Mount Greylock School NPDES permit file should be closed out.

Non point source

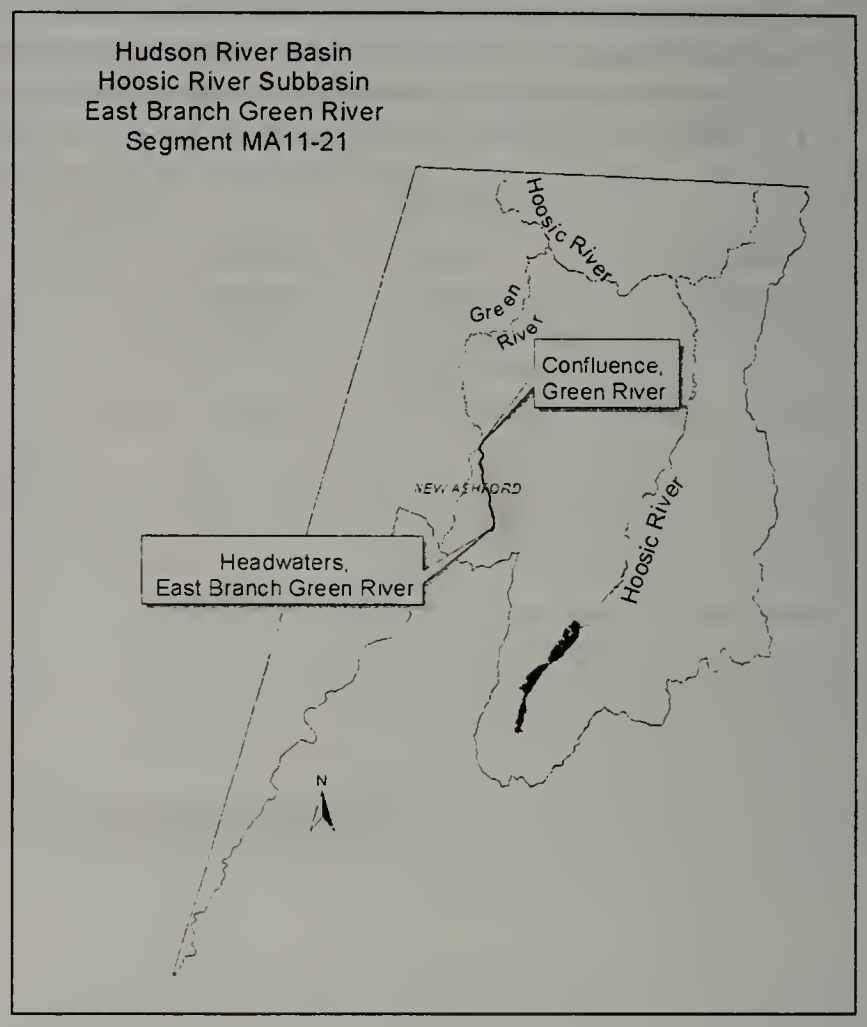
- Review information from the draft *Assessment of Land Use Activities and Nonpoint Source Pollution in the Hoosic River Watershed* (BRPC 1998). This report contains an up-to-date summary of existing and potential nonpoint sources of pollution in the Hoosic River Subbasin. Specifically, two subwatershed planning areas – "Hemlock Brook" and "Green River" are relevant to this segment (MA11-06) of the Green River. Emphasize potential water quality degradation factors and problem sites (agricultural activities in close proximity to the Green River).
- Remove trash and debris from river banks upstream of Rte. 2

EAST BRANCH GREEN RIVER (SEGMENT MA11-21)

Location: Headwaters northeast of Sugarloaf Mt., New Ashford to confluence with Green River, New Ashford. Segment Length: 2.3 miles. Classification: Class B, High Quality Water.

SEGMENT DESCRIPTION

The East Branch Green River, a Class B water high quality water, originates on the northeastern slope of Sugarloaf Mountain in a ravine north of Greylock Road. The river flows north receiving the flow from several unnamed tributaries as well as Mitchell Brook. It joins the mainstem Green River near Roys Road in New Ashford (just south of the New Ashford/Williamstown line).



Land-use estimates for the subwatershed (map inset, gray shaded area):

Forest	99%
Agriculture	1%

Land-use estimates in the 100' buffer:

Forest	84%
Agriculture	14%
Wetland	2%

WITHDRAWALS AND DISCHARGES

None known.

USE ASSESSMENT

AQUATIC LIFE

Biology

The 1997 DWM RBPIII survey was conducted in the East Branch Green River approximately 200m upstream of its confluence with the mainstem Green River (benthic station GE01) (Appendix C). This station served as the regional reference station due to its pristine conditions. A very healthy aquatic community was documented. Habitat quality conditions in this stream were excellent.

The DWM also conducted a fish population survey (RBPV) in the East Branch Green River in the same reach. The fish community at this location was dominated by slimy sculpin (Appendix B, Table B6). Other species included brook trout, blacknose dace, longnose dace, and brown trout. This segment also contained a number of young-of-the-year brook and brown trout. The segment was well shaded with very little attached algae. Four of the five species present in this location can be considered cold water species, which are intolerant of low dissolved oxygen and/or excessive sedimentation. These results are similar to the findings of the 1976 DFWELE survey (MA DEP 1997a, Attachment 1).

AESTHETICS

Based on the 1997 DWM habitat assessment, this use is fully supported (Appendix C).

SUMMARY

The stream was chosen by the MA DEP as the biological monitoring regional reference station in the Hoosic River Subbasin due to its relatively pristine condition. The status of each individual use is summarized below.

East Branch Green River (MA11-21) Use Summary Table

Designated Uses		Status	Causes		Sources	
			Known	Suspected	Known	Suspected
Aquatic Life		2.3 miles support				
Fish Consumption		not assessed				
Primary Contact		not assessed				
Secondary Contact		not assessed				
Aesthetics		2.3 miles support				

RECOMMENDATIONS

ADDITIONAL MONITORING

- Continue to use this stream as a candidate regional reference station.
- A fecal coliform bacteria dataset should also be developed to assess the status of the recreational uses as well as for comparison to the other Hoosic River Watershed streams under dry and wet weather conditions.

IMPLEMENTATION

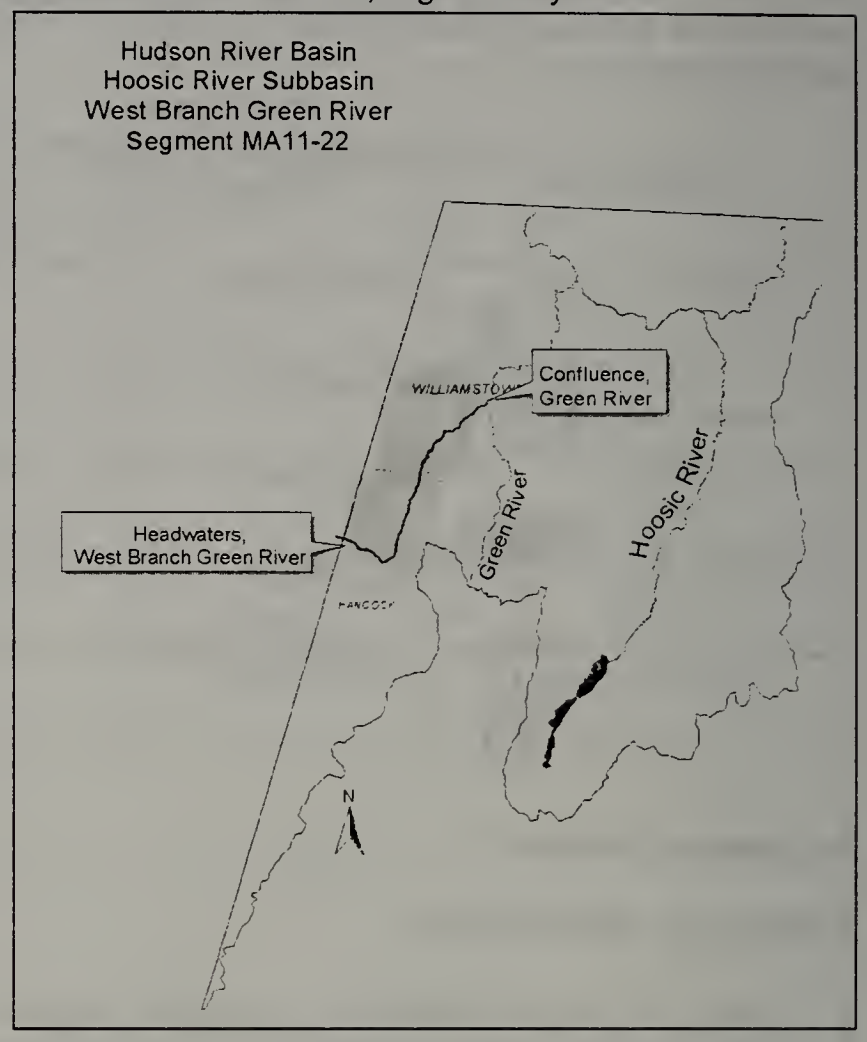
Review information from the draft *Assessment of Land Use Activities and Nonpoint Source Pollution in the Hoosic River Watershed* (BRPC 1998). This report contains an up-to –date summary of existing and potential nonpoint sources of pollution in the Hoosic River Subbasin. Specifically, one subwatershed planning area – "Green River" is relevant to this segment (MA11-21) of the East Branch Green River. Determine if any problems identified in the BRPC report warrant further investigation (water quality monitoring, etc.) and/or remediation (streambank stabilization, etc).

WEST BRANCH GREEN RIVER (SEGMENT MA11-22)

Location: Headwaters west of Route 43, Hancock (near New York Border) to confluence with the Green River, Williamstown. Segment Length: 7.8 miles. Classification: Class B, High Quality Water.

SEGMENT DESCRIPTION

The West Branch Green River, a Class B high quality water, originates near the New York Border in Hancock, north of the Kinderhook/Hoosic River Subbasin divide. The river is bordered on the west by the Taconic Range while on the east by Brodie Mountain. After flowing east through Gardner Hollow, the West Branch Green River flows under Route 43 and turns north, receiving flow from numerous unnamed tributaries draining the Taconic Range. It parallels Route 43 into South Williamstown. Here it flows adjacent to the Waubeeka Golf Links course, crosses under Route 7, and joins the mainstem Green River.



Land-use estimates for the subwatershed in Massachusetts (map inset, gray shaded area):

Forest	79%
Agriculture	15%
Residential and Open Land	2% each

Land-use estimates in the 100' buffer:

Forest	59%
Agriculture	19%
Open Land	13%

WITHDRAWALS AND DISCHARGES

None known.

USE ASSESSMENT

AQUATIC LIFE

Biology

The 1997 DWM RBPIII survey was conducted in the West Branch Green River approximately 100m upstream of Old Mill Road in Williamstown (benthic station GW01) (Appendix C). The data collected from this station were compared to the regional reference station (GE01) on the East Branch Green River. The RBPIII analysis indicated 54% comparability to the reference station (slight impairment). Although instream habitat quality conditions were excellent, the sampling reach was subject to erosion along a portion of the eastern bank.

In 1976 DFWELE (Project No. F-36-R-8) conducted fish population surveys at one station in the West Branch Green River (upstream of Old Mill Road, Williamstown) (MA DEP 1997a, Attachment 1). Their report indicated that the river picked up very fine clay that was visible in the banks. The clay remained suspended in the water column giving it a gray-green hue. Six species of fish were collected including all age classes of brook and brown trout (dominant), longnose sucker, longnose and blacknose dace, and slimy sculpin.

AESTHETICS

Based on the 1997 DWM habitat assessment, this use is supported (Appendix C).

SUMMARY

Slight impairment to the benthos was detected in comparison to the regional reference station. The status of each individual use is summarized below.

West Branch Green River (MA11-22) Use Summary Table

Designated Uses		Status	Causes		Sources	
			Known	Suspected	Known	Suspected
Aquatic Life		7.8 miles partial support		Organic enrichment		Agriculture
Fish Consumption		not assessed				
Primary Contact		not assessed				
Secondary Contact		not assessed				
Aesthetics		7.8 miles support				

RECOMMENDATIONS

ADDITIONAL MONITORING

To fully assess the status of each use in this segment:

- Dissolved oxygen measurements need to be taken at additional sites at worse case (early morning, low flow) scenario times to determine current conditions.
- Turbidity monitoring to characterize any erosional impacts from existing land use practices.
- Additional nutrient sampling throughout the segment to determine current conditions (phosphorus and nitrogen series).
- Bacteria samples at sites throughout the segment on multiple dates and various weather conditions should be collected to establish current conditions.

To identify sources of impairment:

- Stream walk to identify possible sources of: erosion, NPS runoff, undocumented discharges.
- Conduct appropriate monitoring at possible sources established during stream walk.

IMPLEMENTATION

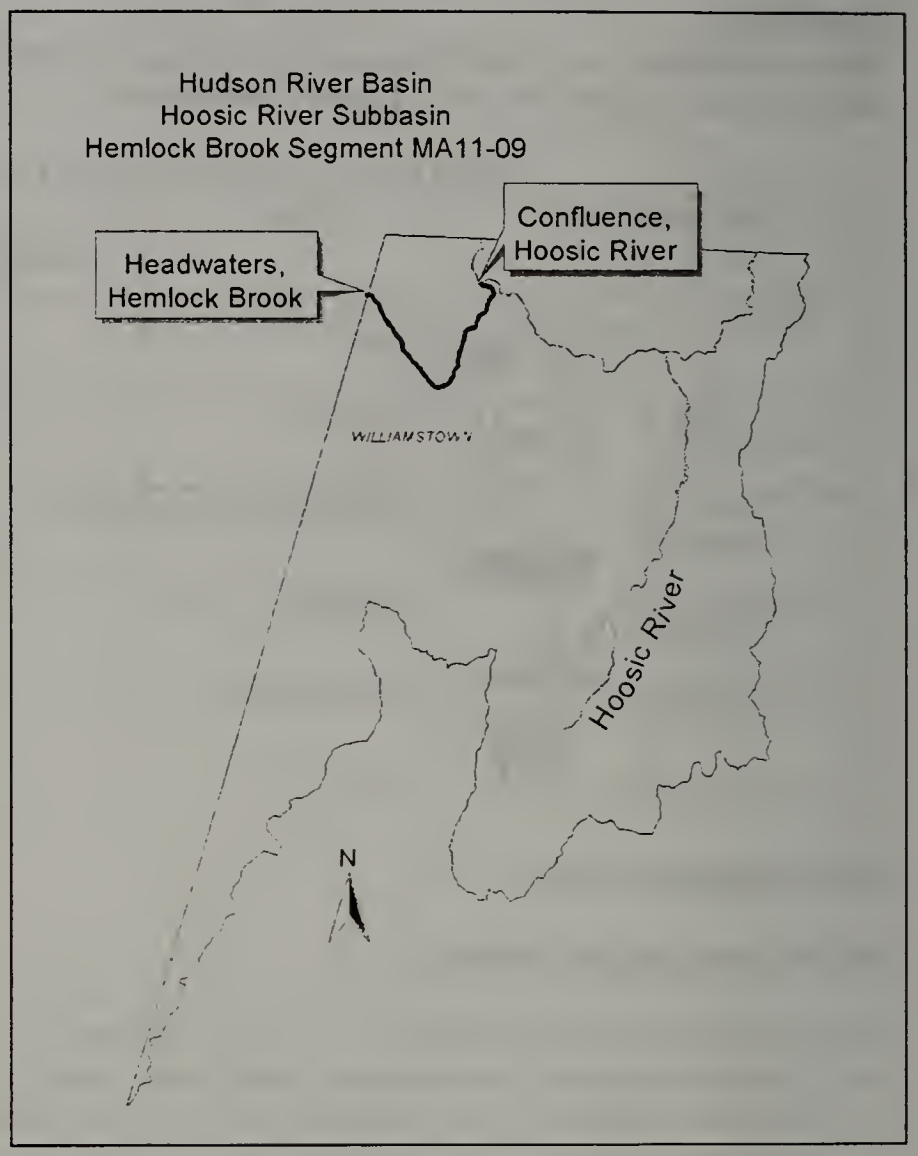
- Review information from the draft *Assessment of Land Use Activities and Nonpoint Source Pollution in the Hoosic River Watershed* (BRPC 1998). This report contains an up-to –date summary of existing and potential nonpoint sources of pollution in the Hoosic River Subbasin. Specifically, one subwatershed planning area – "Green River" is relevant to this segment (MA11-22) of the West Branch Green River. Determine if any problems identified in the BRPC report warrant further investigation (water quality monitoring, etc.) and/or remediation (streambank stabilization, etc).
- Stabilize stream bank where erosion was documented (upstream of Old Mill Rd. in Williamstown).

HEMLOCK BROOK (SEGMENT MA11-09)

Location: Headwaters south of Route 2 in Taconic Trail State Park to the confluence with the Hoosic River in Williamstown. Segment Length: 4.6 miles. Classification: Class B, High Quality Water.

SEGMENT DESCRIPTION

The headwaters of Hemlock Brook are located at the border of New York and Massachusetts draining the eastern slope of Mt. Raimer. The brook flows in a southerly direction, surrounded on both banks by forest, around a small impoundment (the Margaret Lindley Park swimming area) and receives the flow from Sweet Brook just north of the intersection of Taconic Trail and Route 2. During the summer, a portion of the water from the brook is diverted to the swimming area. Continuing in a northerly direction, the brook crosses backs and forth under Route 2 a number of times, flowing through a small commercial development, and receives the flow from another small tributary (Flora Glen). Upon entering downtown Williamstown, Hemlock Brooks flows through low/medium density residential neighborhoods and open land, crosses under Route 2 for the last time, and joins the Hoosic River just downstream from the Hoosac Water Quality District Wastewater Treatment Plant.



Land-use estimates for the subwatershed*:

Forest	79%
Agriculture	11%
Residential	7%

*drainage area estimated

Land-use estimates in the 100' buffer:

Forest	62%
Residential	18%
Agriculture	9%

WITHDRAWALS AND DISCHARGES

None known.

USE ASSESSMENT

Overall, no current data were available to determine if this segment meets water quality standards.

SUMMARY

All designated uses (below) in Hemlock Brook are not assessed at this time.

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
				

Historical Aquatic Life Information
In 1976 DFWELE (Project No. F-36-R-8) conducted a fish population survey at two stations in Hemlock Brook. Species observed included blacknose and longnose dace, slimy sculpin, white and longnose sucker, brown and brook trout (MA DEP 1997a Attachment 1).

RECOMMENDATIONS

ADDITIONAL MONITORING

To fully assess the status of each use in this segment:

- Conduct appropriate monitoring to bracket possible pollution sources established during stream walk.
- Bacteria samples at sites throughout the segment on multiple dates and various weather conditions should be collected to establish current conditions.

IMPLEMENTATION

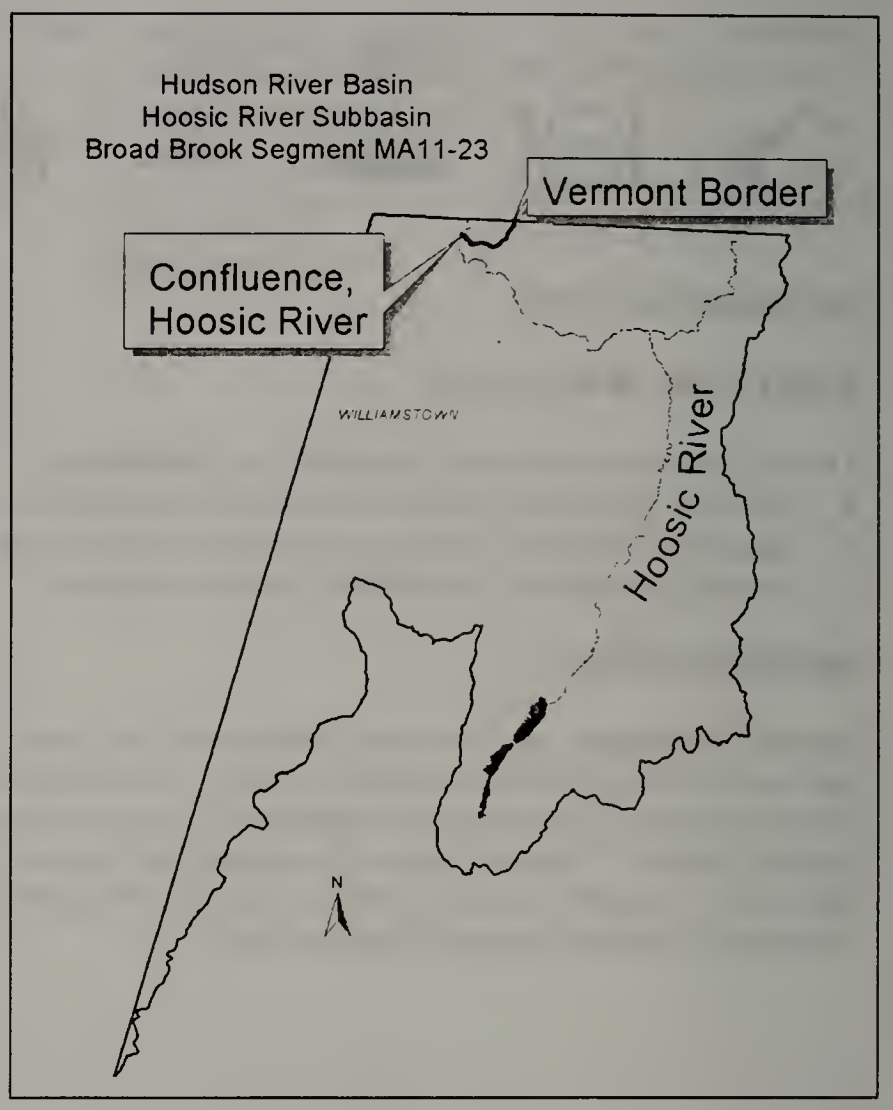
Review information from the draft *Assessment of Land Use Activities and Nonpoint Source Pollution in the Hoosic River Watershed* (BRPC 1998). This report contains an up-to –date summary of existing and potential nonpoint sources of pollution in the Hoosic River Subbasin. Specifically, one subwatershed planning area – "Hemlock Brook" is relevant to Hemlock Brook (MA11-09). Determine if any problems identified in the BRPC report warrant further investigation (water quality monitoring, etc.) and/or remediation (streambank stabilization, etc).

BROAD BROOK (SEGMENT MA11-23)

Location: From the Vermont State Line, Williamstown to the confluence with the Hoosic River, Williamstown. Segment Length: 2.0 miles. Classification: currently Class A (SWSC 1996) reclassification to Class B, High Quality Water in the next revision of the SWSC is recommended.

SEGMENT DESCRIPTION

Surface water withdrawals (for City of North Adams) from Broad Brook occur in Pownal, VT. Since the public water supply is upstream of its Massachusetts reach, Broad Brook should therefore be designated as a Class B, High Quality Water. The brook flows around the southern half of Mason Hill. Initially paralleled by White Oaks Road, the brook then turns west just north of White Oaks. The brook passes Sand Springs (a natural, warm-water 72°F spring that has been developed into a small swimming pool facility), near a commercial development (including a greenhouse complex) then passes under Route 7. Broad Brook then flows under the Boston & Maine Railroad and an industrial development before joining the mainstem Hoosic River.



Land-use estimate in the 100' buffer:

Forest	57%
Residential	32%
Industrial	6%

* Percents are estimated

WITHDRAWALS AND DISCHARGES

WMA:

1. Steinerfilm, Inc. Reg#1-01-341.02 for 0.82 MGD and Permit #9P-1-01-341.03 for 0.54 MGD for a total withdrawal of 1.36 MGD. The facility withdraws water from three wells on their property. In 1998, their average day demand was 0.613 MGD.

NPDES:

1. MA0026638 Steinerfilm, Inc. issued May 1978. Discharge of 0.02 MGD of non-contact cooling water via outfall #001 to Broad Brook. Daily maximum temperature limit of 70°F. Compliance inspection report (October 1988) indicated discharge of 0.81 MGD of non-contact cooling water was to the Hoosic River.

USE ASSESSMENT

Overall, no current data were available to determine if this segment meets water quality standards.

SUMMARY

All designated uses (below) in Broad Brook are not assessed at this time.

Aquatic Life	Fish Consumption	Primary Contact	Secondary Contact	Aesthetics
				

Historical Aquatic Life Information
In 1976 DFWELE (Project No. F-36-R-8) conducted fish population surveys at one station downstream from the Route 7 bridge. Six species of fish were collected including all age classes of brown trout, brook trout, longnose and blacknose dace, white suckers and slimy sculpin (MA DEP 1997a Attachment 1).

RECOMMENDATIONS

ADDITIONAL MONITORING

To fully assess the status of each use in this segment:

- Stream walk (emphasizing the area west of Rte. 7, where a former landfill and other landuse activities may be problematic) to identify possible sources of: erosion, NPS runoff (agriculture), undocumented discharges.
- Conduct appropriate monitoring to bracket possible pollution sources established during stream walk.
- Bacteria samples at sites throughout the segment on multiple dates and under various weather conditions should be collected to establish current conditions.
- Evaluate stream flow conditions (compare streamflow to a similar sized drainage area without water withdrawals) to determine any potential impact associated with water withdrawals.

IMPLEMENTATION

Point Source

- Conduct a site visit to determine whether or not the Steinerfilm discharge is to Broad Brook or the Hoosic River. Develop permit limits accordingly.
- Implement water conservation measures to minimize water withdrawal impacts.

Non point source

- Review information from the draft *Assessment of Land Use Activities and Nonpoint Source Pollution in the Hoosic River Watershed* (BRPC 1998). This report contains an up-to –date summary of existing and potential nonpoint sources of pollution in the Hoosic River Subbasin. Specifically, one subwatershed planning area – "Hemlock Brook" is relevant Broad Brook (MA11-23). Determine if any problems identified in the BRPC report warrant further investigation (water quality monitoring, etc.) and/or remediation (streambank stabilization, etc).

HOOSIC RIVER SUBBASIN - LAKE SEGMENT ASSESSMENTS

The following lake segments in the Hoosic River Subbasin are assessed in this report (Figure 10):

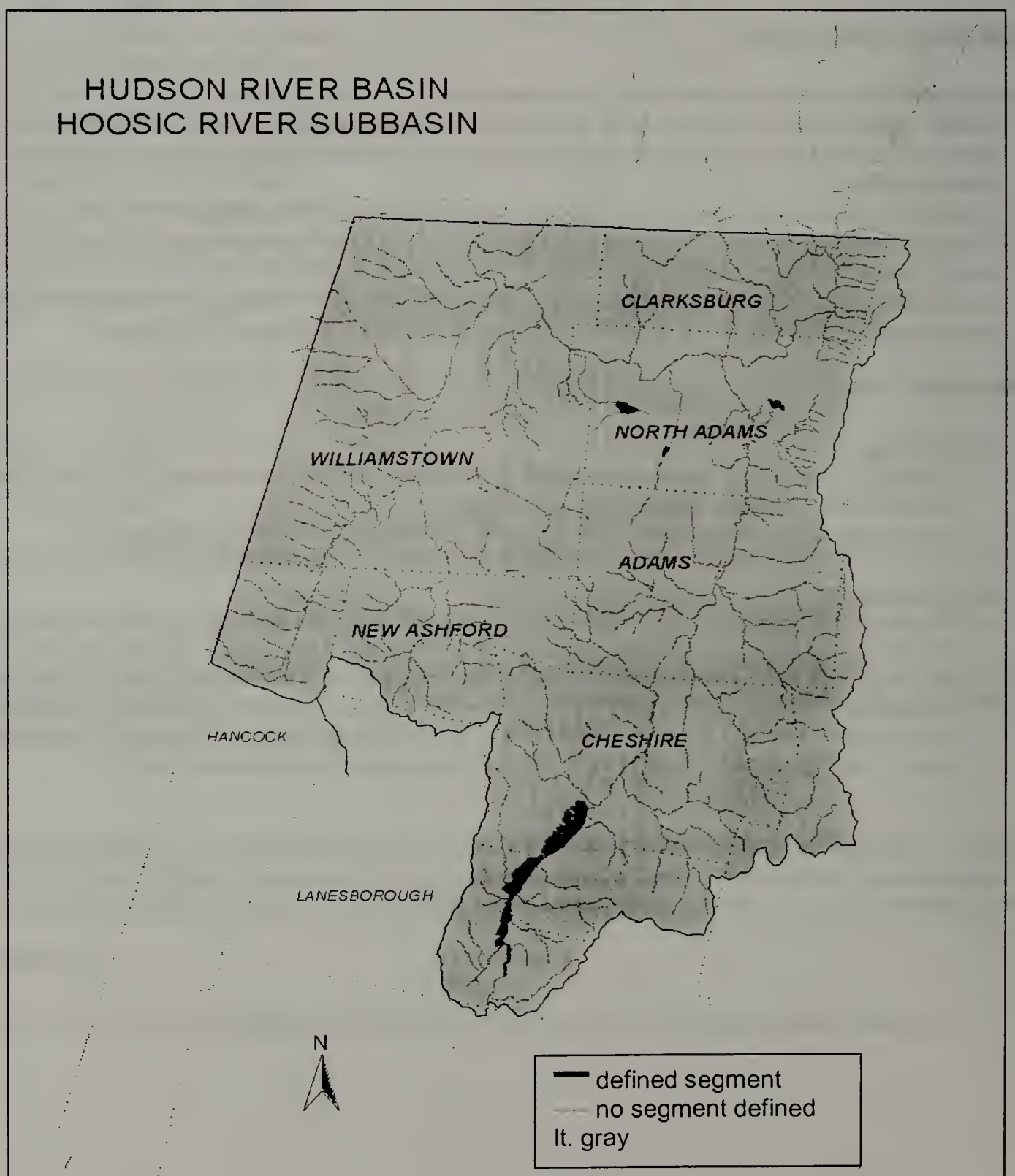
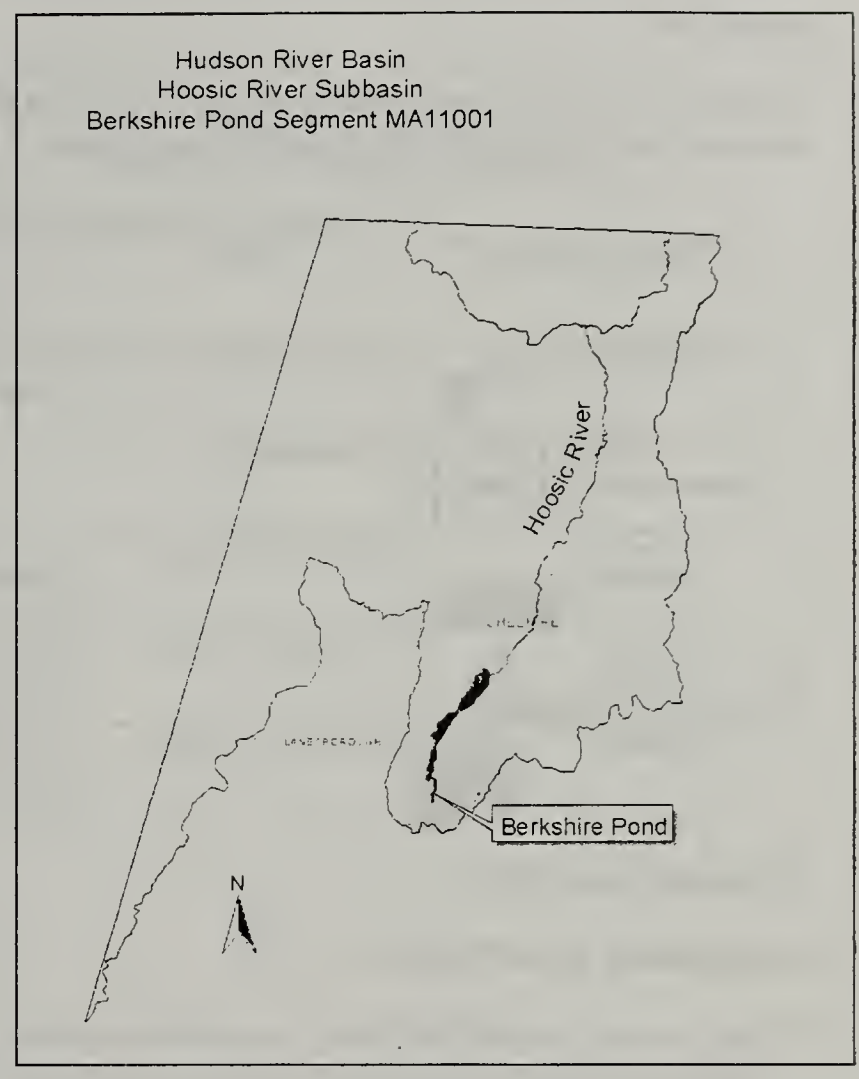


Figure 10 Hoosic River Subbasin Lake Segment Locations

BERKSHIRE POND (Segment MA11001)

Location: Lanesborough. Size: 22 acres. Classification: Class B, High Quality Water. Estimated Trophic Status: Eutrophic.



SEGMENT DESCRIPTION

Berkshire Pond is a 22 acre Class B pond located in Lanesborough. There is one permanent inlet at the southern tip and an intermittent inlet on the northeastern shore. The outlet of the pond is at the northern end near State Road.

Land-use estimates for the subwatershed:

Forest	80%
Residential	9%
Industrial	4%

Perimeter land-use estimates:

Forest	55%
Residential	23%
Agricultural	18%

WITHDRAWAL AND DISCHARGES

None known.

USE ASSESSMENT

AQUATIC LIFE

Biology

The presence of the aquatic non-native species *Myriophyllum spicatum* (Eurasian milfoil) was noted during a 12 August 1997 DWM synoptic survey (Appendix B, Table B8). The invasive species results in an imbalance to the biological community and, therefore, this use is interpreted as partial support (MA DEP 1997b). The presence of the non-native wetland species *Lithrum salicaria* (purple loosestrife) was also noted during the DWM synoptic survey.

FISH CONSUMPTION

This use is not assessed.

PRIMARY CONTACT

Bacteria

No data are available.

Transparency

Secchi disk depth was estimated at greater than 4' during 12 August 1997 DWM synoptic survey (MA DEP 1997b).

Biocommunity

The entire pond was observed to have very dense cover of submerged and floating vegetation during a 12 August 1997 DWM synoptic survey (MA DEP 1997b).

The primary contact recreational use is impaired due to noxious aquatic plant coverage for the entire 22 acres therefore this use is assessed as non support.

SECONDARY CONTACT

Same evaluation as for the primary contact use described above.

AESTHETICS

Same evaluation as for the primary contact use described above.

SUMMARY

Although only limited data were available, Berkshire Pond does not meet water quality standards. The status of each individual use is summarized below.

Berkshire Pond (MA11001) Use Summary Table

Designated Uses		Status	Causes		Sources	
			Known	Suspected	Known	Suspected
Aquatic Life		22 acres partial support	Non-native species		unknown	
Fish Consumption		not assessed				
Primary Contact		22 acres non support	Non-native species; Noxious plants		unknown	
Secondary Contact		22 acres non support	Non-native species; Noxious plants		unknown	
Aesthetics		22 acres non support	Non-native species; Noxious plants		unknown	

RECOMMENDATIONS

ADDITIONAL MONITORING

To fully assess the status of each use in this segment:

- More detailed macrophyte mapping of present cover and species identification (particularly non-natives), location, and frequency of occurrence should be conducted over the entire lake.
- In-lake sampling (to fully characterize the trophic conditions and assess all uses) should include: temperature, pH, dissolved oxygen, and conductivity profiles at the deepest point in the lake, nutrients (total phosphorous, ammonia, and nitrate nitrogen) and alkalinity at the surface and the bottom, if appropriate, at the deepest point. Secchi disk, transparency, chlorophyll *a* and phytoplankton, and fecal coliform at active bathing areas.

To identify sources of impairment:

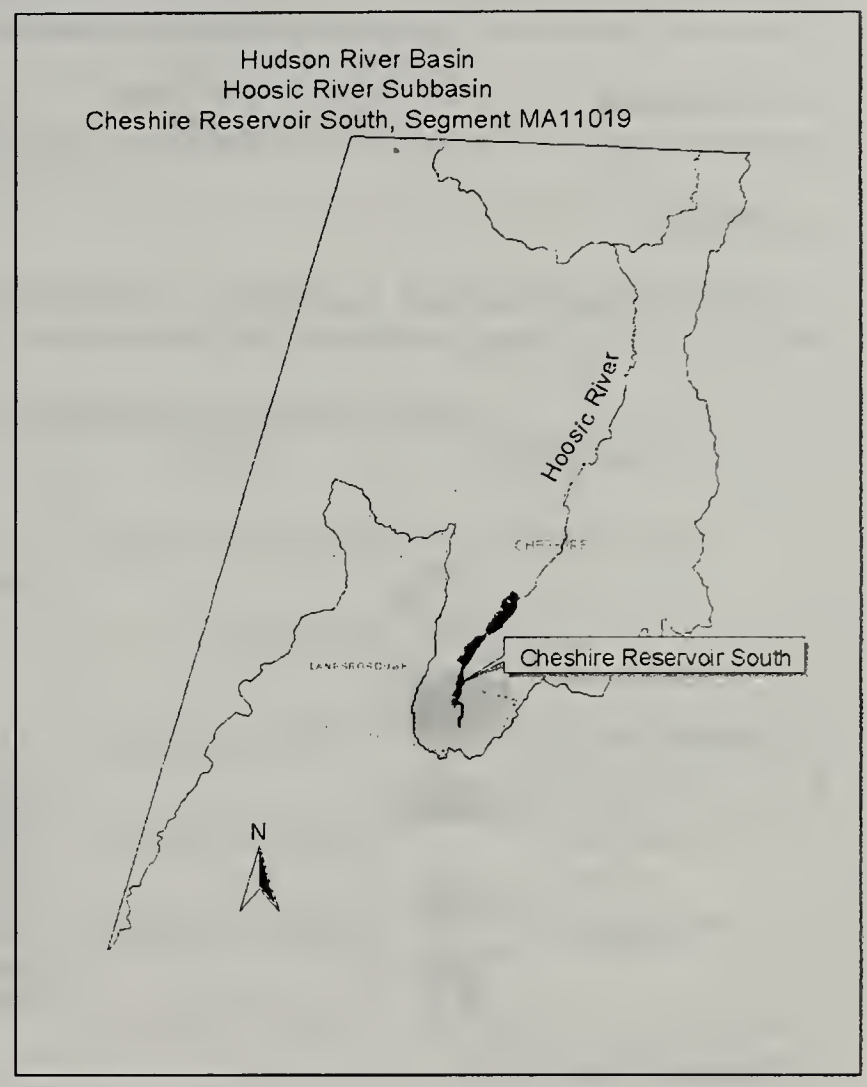
- A shoreline survey and tributary surveys should be conducted to identify possible sources of point and non-point source pollution.
- Tributaries should be sampled for nutrients or other parameters that are determined to be directly or indirectly causing impairment. To determine relative loads of pollutants, multiple sampling events should be conducted simultaneously with flow measurements, emphasizing high flow periods during the course of the year.
- A survey of onsite wastewater practices around the lake perimeter should be conducted.

CHESHIRE RESERVOIR, SOUTH BASIN (SEGMENT MA11019)

Location: Cheshire/Lanesborough. Size: 67 acres. Classification: Class B, High Quality Water.
Estimated Trophic Status: Eutrophic.

SEGMENT DESCRIPTION

Cheshire Reservoir, South Basin is one of the three ponds making up the Cheshire Reservoir. The 67acre Class B pond is located in Cheshire/Lanesborough. There are three permanent inlets, Muddy Brook and the outlet of Berkshire Pond, entering at the southwest and southeast corners, respectively and an unnamed tributary on the eastern shore just south of the town boundary. The outlet of the reservoir is at the northern end near Ingalls Crossing (Nobody's Road).



Land-use estimates for the subwatershed:

Forest	64%
Agriculture	21%
Residential	7%

Perimeter land-use estimates:

Forest	73%
Residential	24%
Wetlands	3%

WITHDRAWAL AND DISCHARGES

None known.

USE ASSESSMENT

AQUATIC LIFE

Biology

The presence of two non-native aquatic species; *Myriophyllum spicatum (*Eurasian milfoil*)* and *Potamogeton crispus*. (curly pondweed) was noted during the 12 August 1997 DWM synoptic survey (Appendix B, Table B8). The invasive species results in an imbalance to the biological community and therefore this use is interpreted as partial support (MA DEP 1997b). The presence of the non-native wetland species *Lithrum salicaria* (purple loosestrife) was also noted during the DWM synoptic survey.

FISH CONSUMPTION

This use is not assessed.

PRIMARY CONTACT

Bacteria

No data are available.

Transparency

Secchi disk depth was estimated at more than 4' (where breaks in vegetation would allow viewing) during the 12 August 1997 DWM synoptic survey (MA DEP 1997b).

Biocommunity

During the 12 August 1997 DWM synoptic survey, the entire pond was observed to have a very dense cover of all types of vegetation, including emergents encroaching from the shores (MA DEP 1997b).

The primary contact recreational use is impaired due to noxious aquatic plant coverage for the entire 67 acres therefore this use is assessed as non support.

SECONDARY CONTACT
Same evaluation as for the primary contact use described above.

AESTHETICS
Same evaluation as for the primary contact use described above.

SUMMARY

Overall Cheshire Reservoir, South Basin does not meet water quality standards based on the limited data set. The status of each individual use is summarized below.

Cheshire Reservoir, South Basin (MA11019) Use Summary Table

Designated Uses		Status	Causes		Sources	
			Known	Suspected	Known	Suspected
Aquatic Life		67 acres partial support	Non-native species		unknown	
Fish Consumption		not assessed				
Primary Contact		67 acres non support	Non-native species; Noxious plants		unknown	
Secondary Contact		67 acres non support	Non-native species; Noxious plants		unknown	
Aesthetics		67 acres non support	Non-native species; Noxious plants		unknown	

RECOMMENDATIONS

ADDITIONAL MONITORING

To fully assess the status of each use in this segment:

- More detailed macrophyte mapping of present cover and species identification (particularly non-natives), location, and frequency of occurrence should be conducted over the entire lake.
- In lake sampling should include: temperature, pH, dissolved oxygen, and conductivity profiles at the deepest point in the lake, nutrients (total phosphorous, ammonia, and nitrate nitrogen) and alkalinity at the surface and the bottom, if appropriate, at the deepest point. These data would be used to more fully characterize the trophic conditions and assess all uses.
- Additional sampling should also include Secchi disk, transparency, chlorophyll *a* and phytoplankton, and fecal coliform at active bathing areas.

To identify sources of impairment:

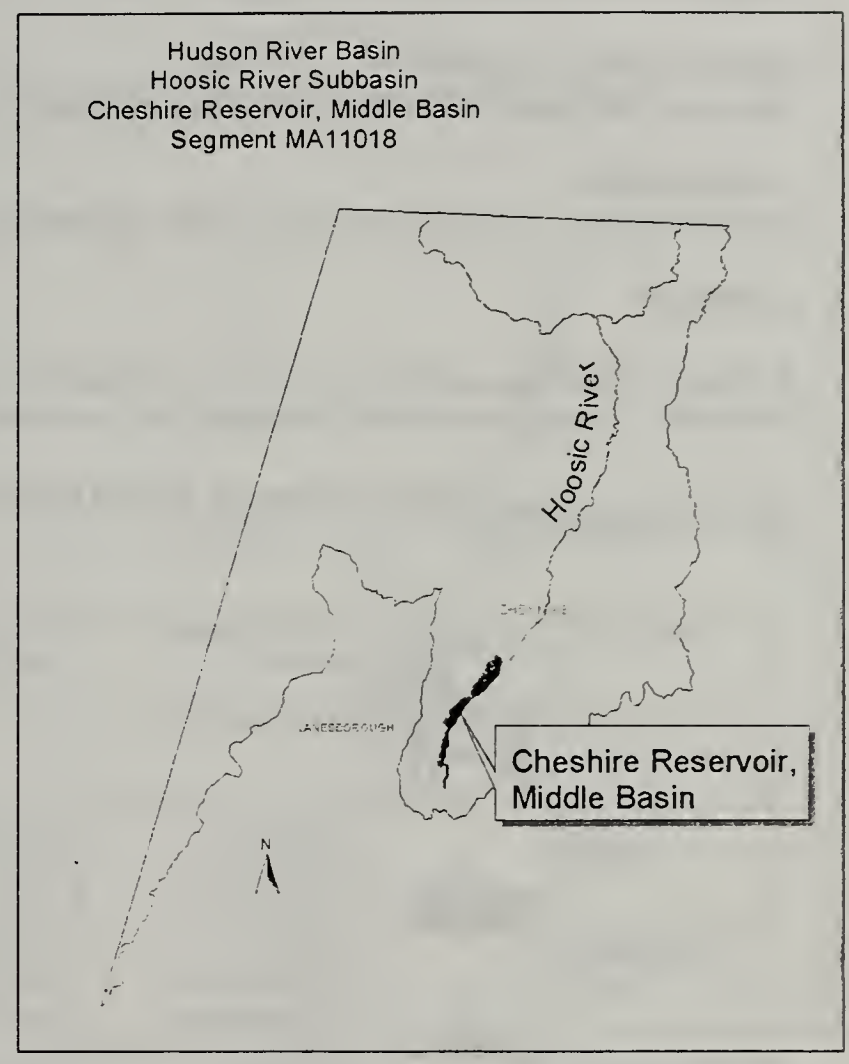
- A shoreline survey and tributary surveys should be conducted to identify possible sources of point and non-point source pollution.
- Tributaries should be sampled for nutrients or other parameters that are determined to be directly or indirectly causing impairment. To determine relative loads of pollutants, multiple sampling events should be conducted simultaneously with flow measurements, emphasizing high flow periods during the course of the year.
- A survey of onsite wastewater practices around the lake perimeter should be conducted.

CHESHIRE RESERVOIR, MIDDLE BASIN (SEGMENT MA11018)

Location: Cheshire/Lanesborough. Size: 132 acres. Classification: Class B, High Quality Water. Estimated Trophic Status: Hypereutrophic.

SEGMENT DESCRIPTION

Cheshire Reservoir, Middle Basin is one of the three ponds making up the Cheshire Reservoir. The 132 acre Class B pond is located in Cheshire/Lanesborough in between the South and North Basins. There are three permanent inlets: the outlet of South Basin at the southern tip, Gore Brook on the southeastern shore and Pettibone Brook on the southwestern shore. The outlet of the Middle Basin is at the northern end at Farnums Causeway.



Land-use estimates for the subwatershed:

Forest	75%
Agriculture	12%
Residential	4%

Perimeter land-use estimates:

Forest	73%
Industrial	11%
Wetlands	9%

WITHDRAWAL AND DISCHARGES

None known.

USE ASSESSMENT

AQUATIC LIFE

Biology

The presence of the non-native aquatic species *Myriophyllum spicatum (*Eurasian milfoil*)* was noted during the 12 August 1997 DWM synoptic survey (Appendix B, Table B8). The invasive species results in an imbalance to the biological community. This use is therefore interpreted as partial support (MA DEP 1997b). The presence of two non-native wetland species *Lithrum salicaria* (purple loosestrife) and *Phragmites* sp. (reed grass, identified on the western shore) was also noted during the DWM synoptic survey.

FISH CONSUMPTION

This use is not assessed.

PRIMARY CONTACT

Bacteria

No data available.

Transparency

During the 12 August 1997 DWM synoptic survey the Secchi disk depth was estimated at less than 4' over most of the basin due to extensive cover of duckweed (MA DEP 1997b).

Biocommunity

Extensive portions of the shore and large areas in the middle of the lake were observed to have a very dense cover of floating and submergent vegetation (MA DEP 1997b). The very dense cover impairs approximately 100 acres based on field observation and GIS calculation.

The primary contact recreational use is moderately impaired over the entire 132 acres related to turbidity however 100 acres are severely impaired due to noxious aquatic plant coverage. Since these 100 acres overlap the area impaired by turbidity, the primary contact recreational use is assessed as partial support for 32 acres and non support for 100 acres.

SECONDARY CONTACT

Same evaluation as for the primary contact use described above.

AESTHETICS

Same evaluation as for the primary contact use described above.

SUMMARY

Although only limited data were available, Cheshire Reservoir, Middle Basin does not meet water quality standards. The status of each individual use is summarized below.

Cheshire Reservoir, Middle Basin (MA11018) Use Summary Table

Designated Uses		Status	Causes		Sources	
			Known	Suspected	Known	Suspected
Aquatic Life		132 acres partial support	Non-native species		unknown	
Fish Consumption		not assessed				
Primary Contact		32 acres partial support 100 acres non support	Non-native species; Noxious plants, Turbidity		unknown	
Secondary Contact		32 acres partial support 100 acres non support	Non-native species; Noxious plants, Turbidity		unknown	
Aesthetics		32 acres partial support 100 acres non support	Non-native species; Noxious plants, Turbidity		unknown	

RECOMMENDATIONS

ADDITIONAL MONITORING

To fully assess the status of each use in this segment:

- More detailed macrophyte mapping of present cover and species identification (particularly non-natives), location, and frequency of occurrence should be conducted over the entire lake.
- In lake sampling should include: temperature, pH, dissolved oxygen, and conductivity profiles at the deepest point in the lake, nutrients (total phosphorous, ammonia, and nitrate nitrogen) and alkalinity at the surface and the bottom, if appropriate, at the deepest point. These data would be used to more fully characterize the trophic conditions and assess all uses.
- Additional sampling should also include Secchi disk, transparency, chlorophyll *a* and phytoplankton, and fecal coliform at active bathing areas.

To identify sources of impairment:

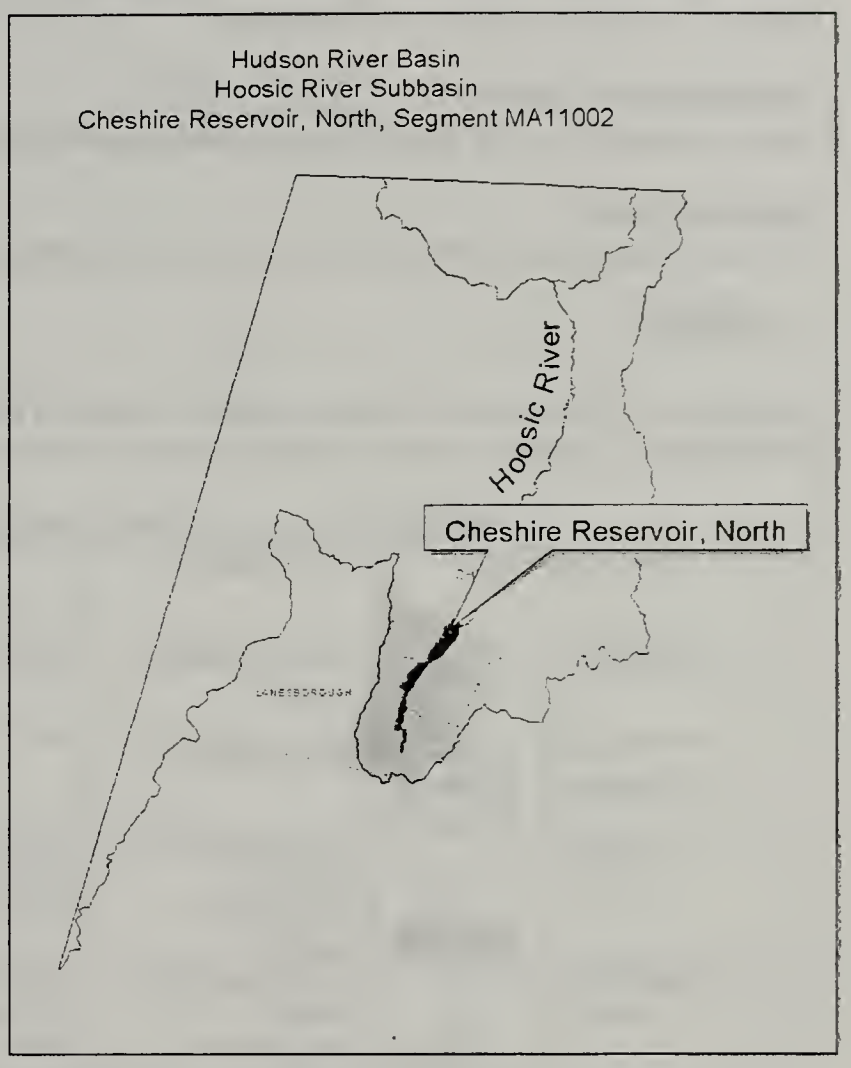
- A shoreline survey and tributary surveys should be conducted to identify possible sources of point and non-point source pollution.
- Tributaries should be sampled for nutrients or other parameters that are determined to be directly or indirectly causing impairment. To determine relative loads of pollutants, multiple sampling events should be conducted simultaneously with flow measurements, emphasizing high flow periods during the course of the year.
- A survey of onsite wastewater practices around the lake perimeter should be conducted.

CHESHIRE RESERVOIR, NORTH BASIN (SEGMENT MA11002)

Location: Cheshire. Size: 218 acres. Classification: Class B, High Quality Water. Estimated Trophic Status: Hypereutrophic.

SEGMENT DESCRIPTION

The North Basin of Cheshire Reservoir (one of the three ponds making up the Cheshire Reservoir) is 218 acres. It is a Class B waterbody located in Cheshire. There are two permanent inlets, the outlet of Middle Basin entering at the southern end and Collins Brook on the eastern shore. The outlet of the North Basin is at the northeast corner near the railroad tracks and Route 8.



Land-use estimates for the subwatershed:

Forest	69%
Residential	7%
Agriculture	5%

Perimeter land-use estimates:

Residential	59%
Forest	26%
Wetlands	8%

WITHDRAWAL AND DISCHARGES

Stormwater Permits

1. MAR00A978 - BFI

USE ASSESSMENT

AQUATIC LIFE

Biology

The presence of the non-native aquatic species *Myriophyllum spicatum (*Eurasian milfoil*)* was noted during a 12 August 1997 DWM synoptic survey (Appendix B, Table B8). The invasive species results in an imbalance to the biological community and therefore this use is interpreted as partial support (MA DEP 1997b). The presence of the non-native wetland species *Lithrum salicaria* (purple loosestrife) was also noted during the DWM synoptic survey.

FISH CONSUMPTION

This use is not assessed.

PRIMARY CONTACT

Bacteria

No are data available.

Transparency

During the 12 August 1997 DWM synoptic survey the Secchi disk depth was estimated at less than 4' over most of the basin due to turbidity and the extensive cover of duckweed (MA DEP 1997b).

Biocommunity

Extensive portions of the basin except in the extreme southern portion were observed to have a very dense cover of floating and submergent vegetation (MA DEP 1997b). The very dense cover impairs approximately 190 acres based on field observation and GIS calculation.

The primary contact recreational use is moderately impaired over the entire 218 acres related to turbidity however 190 acres are severely impaired due to noxious aquatic plant coverage. Since these 190 acres overlap the area impaired by turbidity, the primary contact recreational use is assessed as partial support for 28 acres and non support for 190 acres.

SECONDARY CONTACT

Same evaluation as for the primary contact use described above.

AESTHETICS

Same evaluation as for the primary contact use described above. .

SUMMARY

Although only limited data were available, Cheshire Reservoir, North Basin does not meet water quality standards. The status of each individual use is summarized below.

Cheshire Reservoir, North Basin (MA11002) Use Summary Table

Designated Uses		Status	Causes		Sources	
			Known	Suspected	Known	Suspected
Aquatic Life		218 acres partial support	Non-native species		unknown	
Fish Consumption		not assessed				
Primary Contact		28 acres partial support 190 acres non support	Non-native species; Noxious plants, Turbidity		unknown	
Secondary Contact		28 acres partial support 190 acres non support	Non-native species; Noxious plants, Turbidity		unknown	
Aesthetics		28 acres partial support 190 acres non support	Non-native species; Noxious plants, Turbidity		unknown	

RECOMMENDATIONS

ADDITIONAL MONITORING

To fully assess the status of each use in this segment:

- More detailed macrophyte mapping of present cover and species identification (particularly non-natives), location, and frequency of occurrence should be conducted over the entire lake.
- In lake sampling should include: temperature, pH, dissolved oxygen, and conductivity profiles at the deepest point in the lake, nutrients (total phosphorous, ammonia, and nitrate nitrogen) and alkalinity at the surface and the bottom, if appropriate, at the deepest point. These data would be used to more fully characterize the trophic conditions and assess all uses.
- Additional sampling should also include Secchi disk, transparency, chlorophyll *a* and phytoplankton, and fecal coliform at active bathing areas.

To identify sources of impairment:

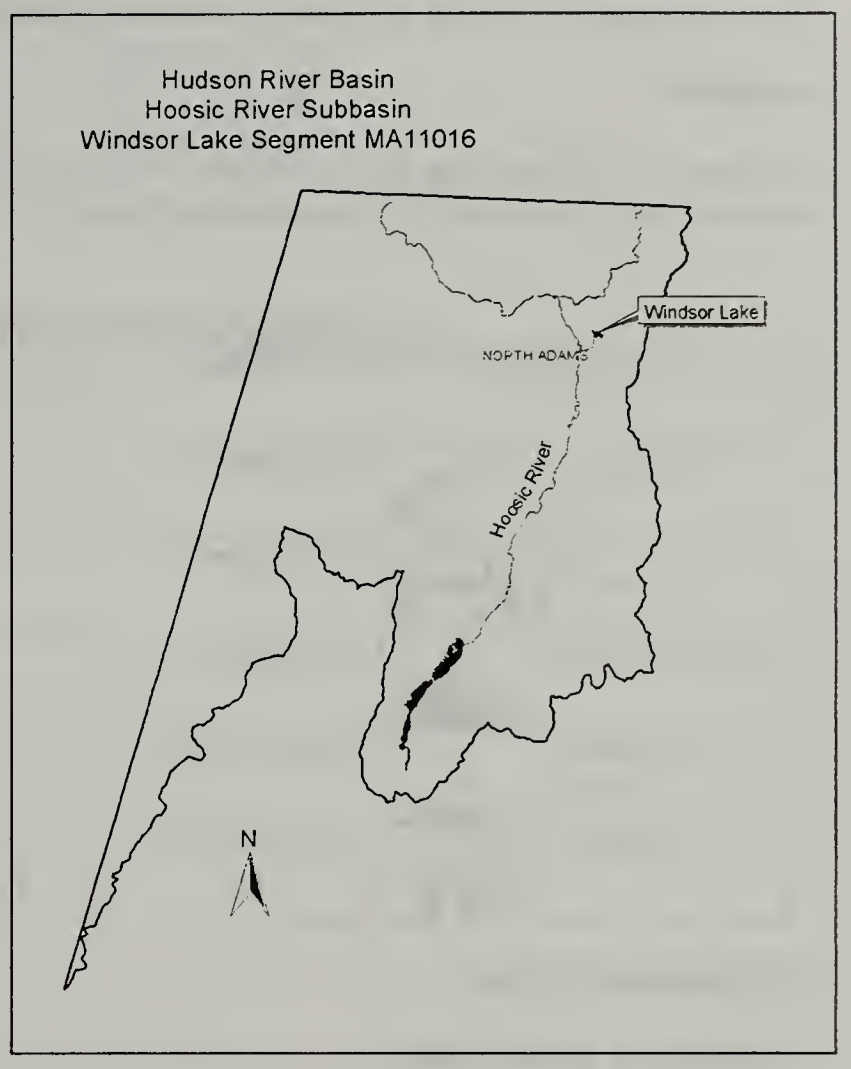
- A shoreline survey and tributary surveys should be conducted to identify possible sources of point and non-point source pollution.
- Tributaries should be sampled for nutrients or other parameters that are determined to be directly or indirectly causing impairment. To determine relative loads of pollutants, multiple sampling events should be conducted simultaneously with flow measurements, emphasizing high flow periods during the course of the year.
- A survey of onsite wastewater practices around the lake perimeter should be conducted.

WINDSOR LAKE (SEGMENT MA11016)

Location: North Adams. Size: 17 acres. Classification: Class B, High Quality Water. Estimated Trophic Status: Undetermined.

SEGMENT DESCRIPTION

Windsor Lake is a Class B waterbody in North Adams. There is one unnamed tributary (appears to be perennial) into the northeast cove. The outlet of the lake is located on the southern shore near Windsor Lake Road. North Adams owns a campground on the south shore of the lake.



Perimeter land-use estimates:

Recreation	38%
Residential	36%
Forest	26%

WITHDRAWAL AND DISCHARGES

None known.

USE ASSESSMENT

AQUATIC LIFE

Biology

No non-native macrophytes were observed during the 12 August 1997 DWM synoptic survey (Appendix B, Table B8). Because of the limited scope of this survey, this use is not assessed.

FISH CONSUMPTION

This use is not assessed.

PRIMARY CONTACT

Bacteria

No data are available.

Transparency

During the 12 August 1997 DWM synoptic survey the Secchi disk depth was estimated at greater than 4' (MA DEP 1997b).

Biocommunity

The 12 August 1997 DWM synoptic survey identified infrequent patches of very dense submergent vegetation reaching the surface (MA DEP 1997b).

Although generally no impairment was noted, too little data are available to assess this use.

SECONDARY CONTACT

Bacteria

No data are available.

Transparency

During the 12 August 1997 DWM synoptic survey the Secchi disk depth was estimated at greater than 4' (MA DEP 1997b).

Biocommunity

The 12 August 1997 DWM synoptic survey identified infrequent patches of very dense submergent vegetation reaching the surface (MA DEP 1997b).

Since no impairment was noted, the secondary contact use is assessed as support for the entire 17 acres.

AESTHETICS

Same evaluation as for the secondary contact use described above.

SUMMARY

Although only limited data were available, Windsor Lake appears to meet water quality standards. The status of each individual use is summarized below.

Windsor Lake (MA11016) Use Summary Table

Designated Uses		Status	Causes		Sources	
			Known	Suspected	Known	Suspected
Aquatic Life		not assessed				
Fish Consumption		not assessed				
Primary Contact		not assessed				
Secondary Contact		17 acres support				
Aesthetics		17 acres support				

RECOMMENDATIONS

ADDITIONAL MONITORING

To fully assess the status of each use in this segment:

- More detailed macrophyte mapping of present cover and species identification (particularly non-natives), location, and frequency of occurrence should be conducted over the entire lake.
- In lake sampling should include: temperature, pH, dissolved oxygen, and conductivity profiles at the deepest point in the lake, nutrients (total phosphorous, ammonia, and nitrate nitrogen) and alkalinity at the surface and the bottom, if appropriate, at the deepest point. These data would be used to more fully characterize the trophic conditions and assess all uses.
- Additional sampling should also include Secchi disk, transparency, chlorophyll *a* and phytoplankton, and fecal coliform at active bathing areas. Check with city of North Adams regarding campground (bathing beach).

To identify sources of impairment:

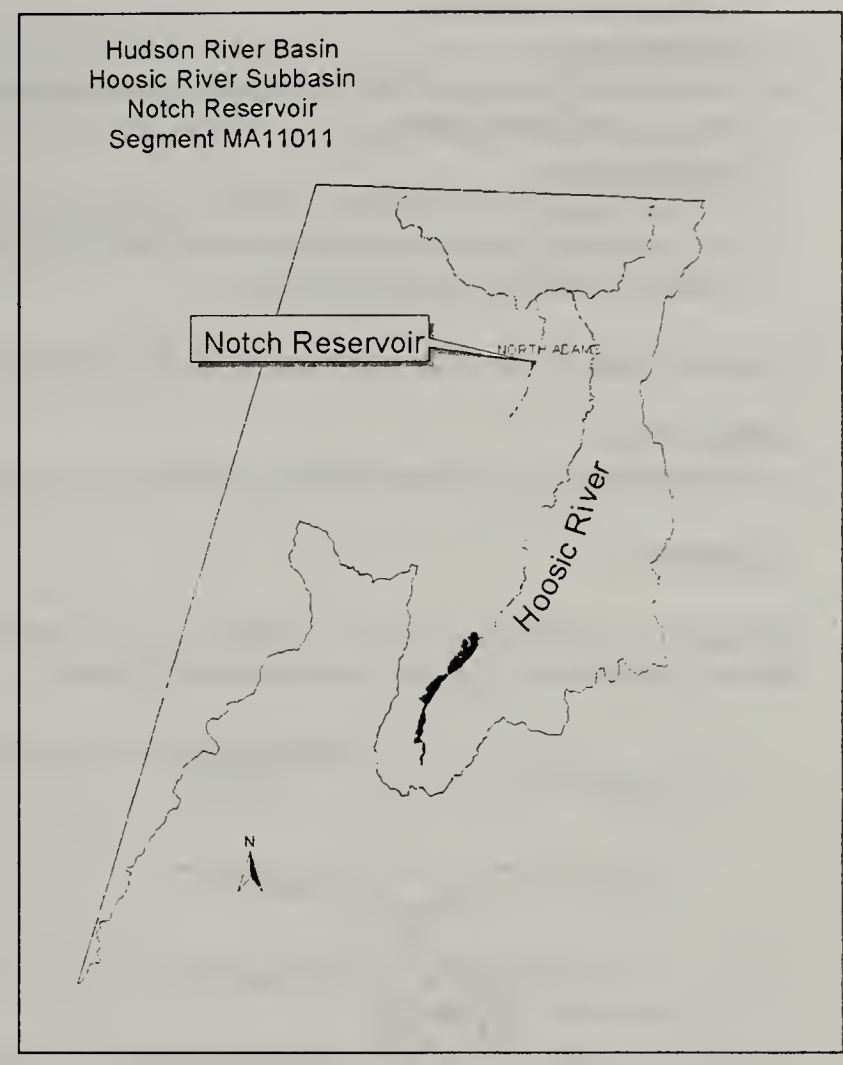
- A shoreline survey and tributary surveys should be conducted to identify possible sources of point and non-point source pollution.
- Tributaries should be sampled for nutrients or other parameters that are determined to be directly or indirectly causing impairment. To determine relative loads of pollutants, multiple sampling events should be conducted simultaneously with flow measurements, emphasizing high flow periods during the course of the year.
- A survey of onsite wastewater practices around the lake perimeter should be conducted.

NOTCH RESERVOIR (SEGMENT MA11011)

Location: North Adams. Size: 25 acres. Classification: Class A, Public Water Supply. Estimated Trophic Status: Undetermined.

SEGMENT DESCRIPTION

Notch Reservoir is a 25 acre Class A waterbody located in North Adams. There is one permanent inlet, Notch Brook entering at the southern end. The outlet of the reservoir is a dam located at the northern end near West Mountain Road. (Downstream from the dam, Notch Brook continues to flow north, forms several waterfalls as it flows through Cascades Park in North Adams, before its confluence with the Hoosic River.)



Land-use estimates for the subwatershed:

Forest	99%

Perimeter land-use estimates:

Forest	86%
Residential	14%

WITHDRAWAL AND DISCHARGES

WMA:

1. WMA Reg# 1-01-209.01 –North Adams Water Department. The town is registered for 2.8 MGD from 5 sources. One of their sources is Notch Reservoir (PWS # 1209000-01S).

USE ASSESSMENT

AQUATIC LIFE

Biology

No non-native macrophytes were observed during a 12 August 1997 DWM synoptic survey (Appendix B, Table B8). Due to the limited scope of this survey this use is interpreted as not assessed.

FISH CONSUMPTION

This use is not assessed.

DRINKING WATER

The water supply, which receives treatment, has no history of any closures. This use is assessed as support.

PRIMARY CONTACT

Bacteria

No data are available.

Transparency

During the 12 August 1997 DWM synoptic survey the Secchi disk depth was estimated at greater than 4' (MA DEP 1997b).

Biocommunity

The 12 August 1997 DWM synoptic survey identified a very dense growth of submergent vegetation in this reservoir throughout its littoral zone (MA DEP 1997b).

Although generally no impairment was noted, too little data are available to assess this use.

SECONDARY CONTACT

Bacteria

No data are available.

Transparency

During the 12 August 1997 DWM synoptic survey the Secchi disk depth was estimated at greater than 4' (MA DEP 1997b).

Biocommunity

The 12 August 1997 DWM synoptic survey identified a very dense growth of submergent vegetation in this reservoir throughout its littoral zone (MA DEP 1997b). The growth habit of the identified aquatic vegetation would not impair this use.

The secondary contact use is assessed as support for the entire 25 acres.

AESTHETICS

Same evaluation as for the secondary contact use described above.

SUMMARY

Although only limited data were available, Notch Reservoir appears to meet water quality standards. The status of each individual use is summarized below.

Notch Reservoir (MA11011) Use Summary Table

Designated Uses	Status	Causes		Sources	
		Known	Suspected	Known	Suspected
Aquatic Life	not assessed				
Fish Consumption	not assessed				
Drinking Water	25 acres support				
Primary Contact	not assessed				
Secondary Contact	25 acres support				
Aesthetics	25 acres support				

RECOMMENDATIONS

ADDITIONAL MONITORING

To fully assess the status of each use in this segment:

[Note: These may not be attainable since the waterbody is protected as a public water supply.]

- More detailed macrophyte mapping of present cover and species identification (particularly non-natives), location, and frequency of occurrence should be conducted over the entire lake.
- In lake sampling should include: temperature, pH, dissolved oxygen, and conductivity profiles at the deepest point in the lake, nutrients (total phosphorous, ammonia, and nitrate nitrogen) and alkalinity at the surface and the bottom, if appropriate, at the deepest point. These data would be used to more fully characterize the trophic conditions and assess all uses.
- Additional sampling should also include Secchi disk, transparency, chlorophyll *a* and phytoplankton.

To protect against any future impairment:

- The watershed should be maintained in its undeveloped state to the maximum extent possible.

- If any future development occurs in the watershed it should be accompanied by the strictest measures possible to minimize effects on the reservoir.

Other:

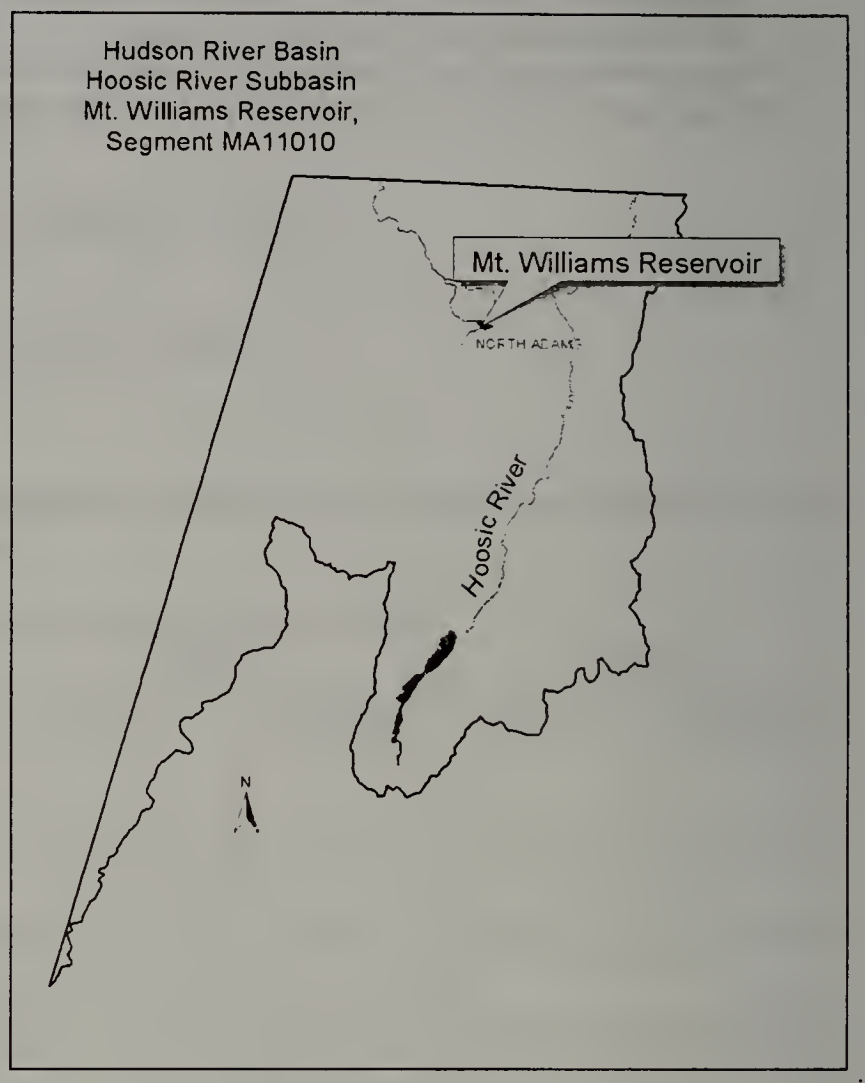
- If Notch Reservoir remains an active surface water supply withdrawal, it is recommended that Notch Brook be evaluated for potential adverse impacts related to the loss of streamflow (e.g., drying up of waterfalls in Cascade Park). Consider evaluating Notch Brook as a separate stream segment when the next assessment is performed in 2002.

MOUNT WILLIAMS RESERVOIR (SEGMENT MA11010)

Location: North Adams. Size: 43 acres. Classification: Class A, Public Water Supply. Estimated Trophic Status: Undetermined.

SEGMENT DESCRIPTION

Mount Willliams Reservoir is a 43 acre Class A waterbody located in North Adams. There is one intermittent inlet, an unnamed tributary entering at the eastern end. The outlet of the reservoir is a dam located at the western end near the Appalachian Trail. (Downstream from the dam, Paull Brook continues to flow northwest to its confluence with the Hoosic River.)



The watershed is completely forested.

WITHDRAWAL AND DISCHARGES

WMA:

1. WMA Reg# 1-01-209.01 –North Adams Water Department. The town is registered for 2.8 MGD from 5 sources. One of their sources (PWS # 1209000-04S) is Mount Williams Reservoir.

USE ASSESSMENT

AQUATIC LIFE

Biology

No non-native macrophytes were observed during the 12 August 1997 DWM synoptic survey (Appendix B, Table B8). Because of the limited scope of this survey, the aquatic life use is not assessed.

FISH CONSUMPTION

This use is not assessed.

DRINKING WATER

The water supply, which receives treatment, has no history of any closures. This use is assessed as support.

PRIMARY CONTACT

Bacteria

No data are available.

Transparency

During the 12 August 1997 DWM synoptic survey the Secchi disk depth was estimated at greater than 4' (MA DEP 1997b).

Biocommunity

No dense vegetation was observed during the 12 August 1997 DWM synoptic survey (MA DEP 1997b).

Although no impairment was noted, too little data are available to assess this use.

SECONDARY CONTACT

Bacteria

No data are available.

Transparency

During the 12 August 1997 DWM synoptic survey the Secchi disk depth was estimated at greater than 4' (MA DEP 1997b).

Biocommunity

No dense vegetation was observed during the 12 August 1997 DWM synoptic survey (MA DEP 1997b).

The secondary contact use is assessed as support for the entire 43 acres.

AESTHETICS

Same evaluation as for the secondary contact use described above.

SUMMARY

Although only limited data were available, Mount Williams Reservoir appears to meet water quality standards. The status of each individual use is summarized below.

Mount Williams Reservoir (MA11010) Use Summary Table

Designated Uses	Status	Causes		Sources	
		Known	Suspected	Known	Suspected
Aquatic Life	not assessed				
Fish Consumption	not assessed				
Drinking Water	43 acres support				
Primary Contact	not assessed				
Secondary Contact	43 acres support				
Aesthetics	43 acres support				

RECOMMENDATIONS

ADDITIONAL MONITORING

To fully assess the status of each use in this segment:

[Note: These may not be attainable since the waterbody is protected as a public water supply.]

- More detailed macrophyte mapping of present cover and species identification (particularly non-natives), location, and frequency of occurrence should be conducted over the entire lake.
- In lake sampling should include: temperature, pH, dissolved oxygen, and conductivity profiles at the deepest point in the lake, nutrients (total phosphorous, ammonia, and nitrate nitrogen) and alkalinity at the surface and the bottom, if appropriate, at the deepest point. These data would be used to more fully characterize the trophic conditions and assess all uses.
- Additional sampling should also include Secchi disk, transparency, chlorophyll *a* and phytoplankton.

To protect against any future impairment:

- The watershed should be maintained in its undeveloped state to the maximum extent possible.
- If any future development occurs in the watershed it should be accompanied by the strictest measures possible to minimize affects on the reservoir.

THE KINDERHOOK SUBBASIN

The Kinderhook Subbasin (Figure 11), bordered by NY State on the west, the Hoosic River Subbasin to the north and the Housatonic Basin on the southeast, drains approximately 22 square miles in Massachusetts (MA DEM 1989a). The drainage area includes portions of Hancock, Lanesborough, and Richmond. This area drains west into the Hudson River in NY State.

Land use (EOEA 1997) in the Massachusetts portion of the Kinderhook River Basin is primarily forested (83%). Agricultural activity (approximately 9% of the watershed area) is located along much of the Kinderhook Creek corridor. The Jiminy Peak Ski Area comprises much of the open land making up approximately 5% of the watershed.

Three tributaries, Rathburn, Jones, and Whitman Brooks drain the eastern spine between Round and Misery Mountains in the Taconic Range. These brooks all discharge into Kinderhook Creek which originates in a non forested wetland adjacent to Route 43 and slightly north of the Hancock Central School/ Whitman Road. Bentley Brook drains west into Kinderhook Creek formed between the southern slope of Sheeps Heaven Mountain and the northwestern slope of Potter Mountain. The Jiminy Peak Ski Area is located on the northwest slope of Potter Mountain. Two small unnamed perennial streams also flow into Kinderhook Creek near the center of Hancock. The southern tip of the Kinderhook Subbasin in Massachusetts is drained by Berry Creek and its small intermittent tributary, Red Oak Brook.

There are a total of seven named streams (mentioned above) in the Kinderhook Subbasin. Only one, Kinderhook Creek (4.7 river miles) is assessed in this report.

Kinderhook Subbasin contains four named lakes with a total area of 38 acres. None of these lakes have been assessed.

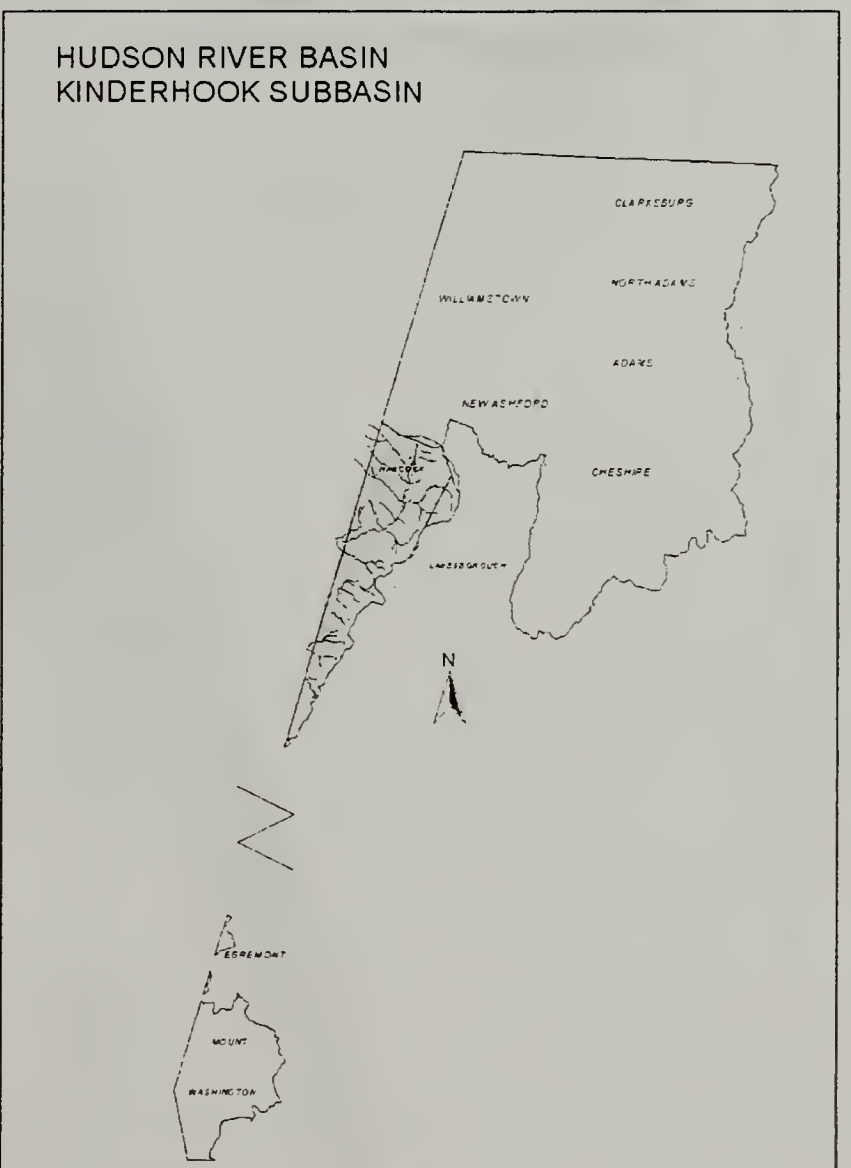


Figure 11 Kinderhook Subbasin Stream Network

KINDERHOOK SUBBASIN - RIVER SEGMENT ASSESSMENTS

The following segment in the Kinderhook Subbasin is included in this report (Figure 12):

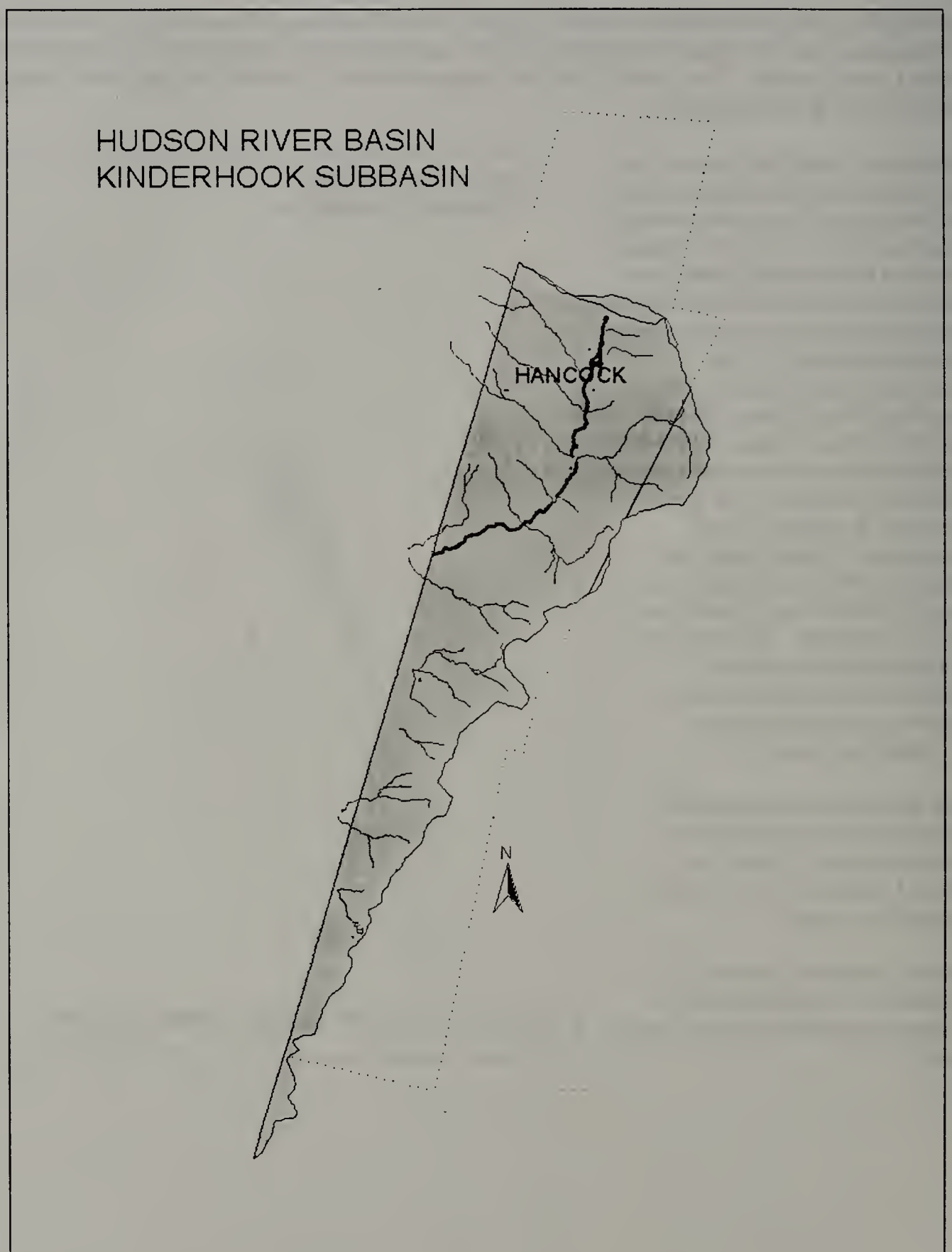


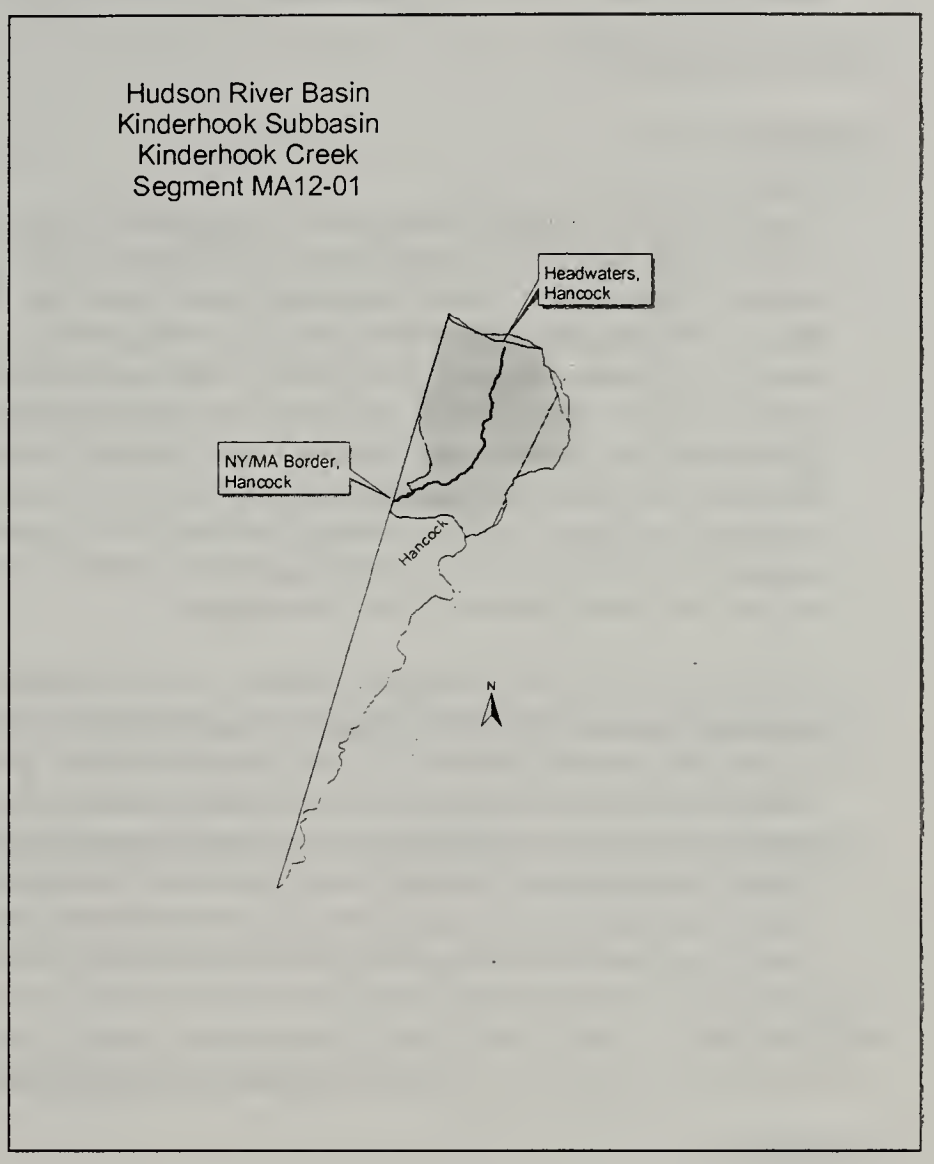
Figure 12 Kinderhook Subbasin Stream Segment Location

KINDERHOOK CREEK (SEGMENT MA12-01)

Location: Headwaters northwest of Sheeps Heaven Mountain and east of Route 43, Hancock to the New York/Massachusetts border, Hancock. Segment Length: 4.7 miles. Classification: Class B, Cold Water Fishery.

SEGMENT DESCRIPTION

Kinderhook Creek, a Class B Cold Water Fishery, originates in a steep sided valley in Hancock, Massachusetts between Brodie Mountain Ridge to the east and the Taconic Ridge to the west. Draining a sizable wetland, Kinderhook Creek flows south between Rounds and Misery Mountains along the New York/Massachusetts border. The creek is fed by four tributaries, Rathburn, Jones, and Whitman brooks entering from the west and Bentley Brook which enters from the east. Kinderhook Creek turns southwest and is joined by two small-unnamed perennial streams near the center of Hancock. The creek crosses under Route 43 twice and flows into Stephentown, New York.



Land-use estimates for the subwatershed in Massachusetts:

Forest	77%
Agriculture	12%
Open Land	8%

Land-use estimates in the 100' buffer in Massachusetts:

Agriculture	37%
Forest	36 %
Wetland	15%

WITHDRAWALS AND DISCHARGES

WMA:

1. PWS 1121011-01G and 02G—Beaver Pond Meadows Condominiums is managed by Jiminy Peak. The condominium development utilizes 2 wells to supply approximately 0.025 MGD to the facility.

2. PWS 1121004-01G, 02G, 03G, 04G, 05G, and 06G (WMA Reg# 1-01-121.01 and Permit # 9P3-1-01-121.01). Jiminy Peak Resort and Ski Area - the resort uses approximately 0.029 MGD with a maximum monthly use of 0.040 MGD. The ski area utilizes approximately 0.706 MGD for snow making purposes. The facility takes water from six well sources and one surface source. The ski area is registered for 0.45 MGD and permitted for 1.05 MGD for a total withdrawal of 1.50 MGD.

NPDES:

1. Jiminy Peak Resort and Ski Area is authorized to discharge via a subsurface discharge permit, # 1 – 188, up to 0.1 MGD of treated waste water to the ground. 1998 flow calculations shows an average flow of between 0.030 and 0.050 MGD. The facility also utilizes UV disinfection, prior to discharge.

USE ASSESSMENT

AQUATIC LIFE

Biology

The 1997 DWM RBPIII survey was conducted at two locations in Kinderhook Creek bracketing the Jiminy Peak water withdrawal structure (Appendix C). The most upstream station (KC01) was located in the stream reach between Brodie Mountain Road and the creek's confluence with Bentley Brook. The downstream station (KC02) was located approximately 240m downstream from the creek's confluence with Bentley Brook. Although instream habitat provided very good substrates and well developed riffle habitat, the upstream station suffered from low water levels. Filamentous algae (streaming and mats) were present in both stream reaches sampled. Although no impacts were detected at KC02 when compared against KC01, moderate impacts were documented at both the upstream and downstream stations (29 and 38%, respectively) in comparison to the regional reference station (GE01) on the East Branch Green River. Based on the impairment detected, the aquatic life use is assessed as non support.

The 1997 DWM RBPV fish population survey indicated an assemblage that included three cold water species (Appendix B, Table B6). Fish collected from Kinderhook Creek upstream of its confluence with Bentley Brook included, in order of abundance, slimy sculpin, brown trout, and brook trout. Young-of-the-year sculpin were too small to net and too numerous to count. Many young-of-the-year brown trout were also present. The downstream reach contained the same three species in the same order of abundance, however, numbers of fish increased. The downstream reach was more shaded (75%) and may have included slightly more diverse fish cover in the forms of snags. Young-of-the-year brown trout and slimy sculpin were abundant downstream of the water withdrawal.

AESTHETICS

Based on the 1997 DWM habitat assessment (Appendix C), this use is fully supported.

SUMMARY

Moderate impacts were detected in Kinderhook Creek at both stations sampled. Although the causes and sources of impairment are unknown, the only apparent sources of pollution in the upstream watershed are agricultural and road runoff. Kinderhook Creek does, however, support slimy sculpin, brook and brown trout. The water withdrawal on Kinderhook Creek did not appear to be having a demonstrable negative impact on the reach immediately downstream nor does it appear to pose a barrier to migration of fishes. The intake structure itself appears to be attracting and holding fish, which could be detrimental to those fish when the withdrawal is operating. The status of each individual use is summarized below.

Kinderhook Creek (MA12-01) Use Summary Table

Designated Uses		Status	Causes		Sources	
			Known	Suspected	Known	Suspected
Aquatic Life		4.7 miles non support		Organic enrichment		Agriculture, road runoff
Fish Consumption		not assessed				
Primary Contact		not assessed				
Secondary Contact		not assessed				
Aesthetics		4.7 miles support				

RECOMMENDATIONS

ADDITIONAL MONITORING

To fully assess the status of each use in this segment:

- A fecal coliform bacteria dataset should also be developed to assess the status of the recreational uses.
- Additional monitoring should be conducted to determine the cause of impairment to the benthic community. More reconnaissance is necessary to develop the monitoring needs (e.g., diurnal DO measurements, nutrients, RBPIII).

To identify sources of impairment:

- Stream walk to identify possible sources of: erosion, NPS runoff, and undocumented discharges.
- Conduct appropriate monitoring at possible sources established during stream walk.
- Land use determination and inventory of wastewater practices.

IMPLEMENTATION

Point source

- Stormwater runoff controls should be implemented at development sites and at the ski area.

Non point source

- Establish a NPS management plan based on potential water quality degradation factors and problem sites (agricultural activities in close proximity to the Kinderhook Creek).

THE BASHBISH SUBBASIN

The Bashbish River Basin (Figure 13) is located in the southwest corner of MA draining 15 square miles of Egremont and Mount Washington (MA DEM 1989a). The flow from Bashbish Brook also drains west into NY State and eventually into the Hudson River. Just before crossing the state line, the brook flows through Bashbish falls, one of the largest and most scenic waterfalls in MA.

Land use in the Massachusetts portion of the Bashbish River Basin is primarily forested (93%). The Catamount Ski Area comprises much of the open land making up approximately 3% of the watershed. Small isolated areas in the watershed are used for agriculture making up approximately 2% of the watershed area.

Bashbish Brook has several named tributaries including Ashley Hill, City, Wright and Cedar brooks. The Catamount Ski Area is located on the north face of Mount Fray in Egremont.

There are a total of seven named streams in the Bashbish Subbasin, none of which are assessed in this report.

Bashbish Subbasin contains four named lakes with a total area of 32 acres. None of these lakes have been assessed.

Withdrawals and discharges:

1. PWS # 1090007 – Catamount Ski Area. The ski area is registered (1-01-090.01) to withdraw 0.40 MGD from two surface sources for snow making purposes. Based on the 1998 annual report, the ski area used approximately 0.245 MGD for snow making in 1998. The ski area also uses a drilled well for potable water use, which is not covered under the WMA registration.

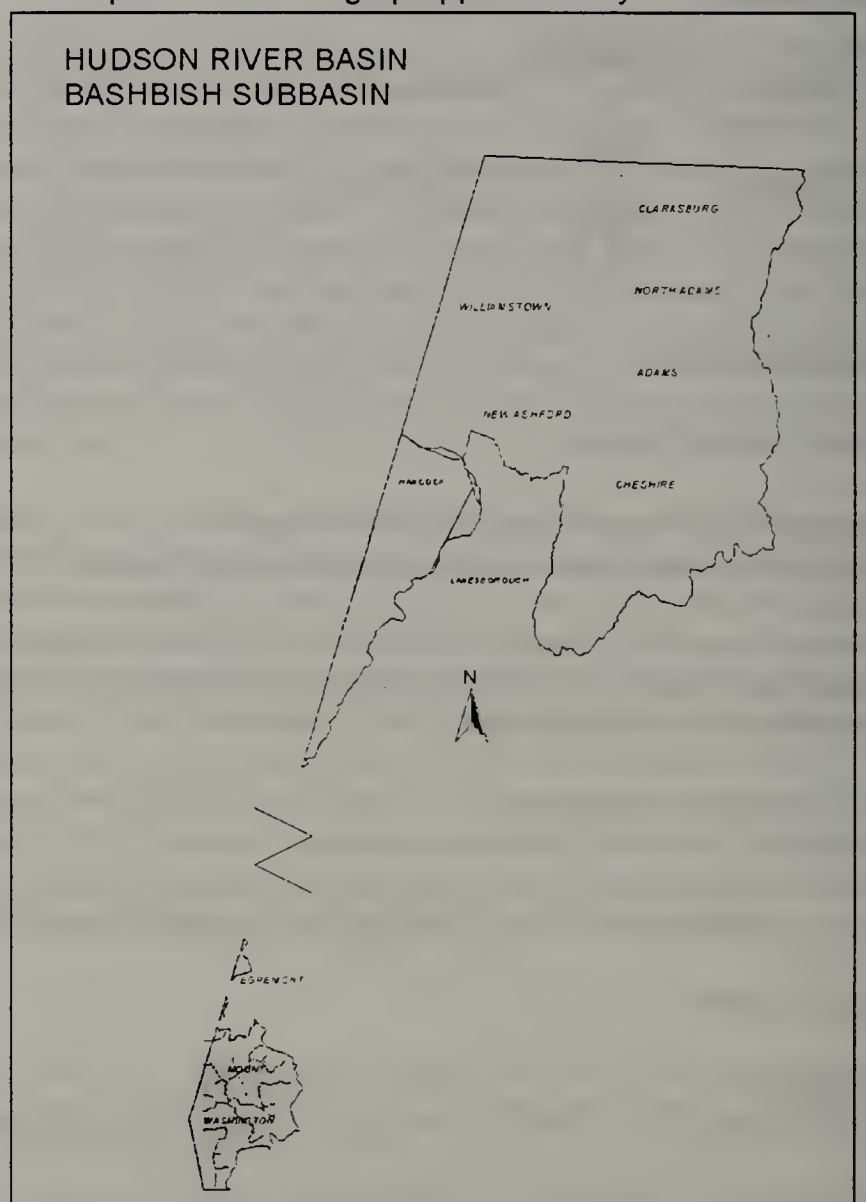


Figure 13 Bashbish Subbasin Stream Network

Historically no segments (river or lake) have been assessed in this Subbasin. There is no current water quality information available on any of the waterbodies in the Bashbish Subbasin and therefore no segments are discussed here. Water quality monitoring in this subbasin should be considered.

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APPENDIX A - DEP DWM QA/QC

Introduction

Quality Assurance/Quality Control (QA/QC) activities were conducted as part of the DEP DWM Hudson River Basin Monitoring Survey in 1997. This QA/QC review was conducted to ensure that the collection and analysis of the monitoring data was of high quality. The 1997 monitoring data subjected to this QA/QC review includes the following: discrete water samples, fish tissue samples and *in-situ* water quality measurements. All discrete water sample and fish tissue monitoring data were reviewed independently by the Wall Experiment Station's (WES) Quality Assurance Program and the Division of Watershed Management's (DWM) Quality Assurance Officer and Assessment Coordinator. All *in-situ* water quality measurements were reviewed independently by DWM's Hydrolab® Instrument Coordinator and Database Manager. Data that fell outside established QA/QC acceptance criteria were investigated and may have been subject to censoring. This Quality Assurance/Quality Control appendix is divided into three sections: A.1 field and laboratory data objectives; A.2 QA/QC data; A.3 analytical methods.

A.1 Field and Laboratory QA/QC Objectives

Data collected by DWM in the 1997 Hudson River Basin survey was subject to field and laboratory data quality objectives. Section A.1.1 outlines the field collection objectives and laboratory quality control for discrete water samples. Section A.1.2 includes fish tissue laboratory quality control methods and Section A.1.3 includes Hydrolab QA/QC procedures.

A.1.1 Discrete Water Sample Data

FIELD

The collection of discrete water sample analytes followed DWM Standard Operating Procedures [1,2]. Four field collection quality control criteria were applied to the Hudson River Basin 1997 discrete water sample data:

1.0 Sampling/Analysis Holding Time: Each analyte has a standard holding time that has been established to ensure sample/analysis integrity. Refer to DWM Standard Operating Procedure Table 1.0 CN# 1.1 [2] for a complete listing. If the standard holding time was exceeded, this objective is violated.

2.0 Quality Control Sample Frequency: At a minimum, one field blank and one replicate must be collected for every ten samples by any given sampling crew on any given date. If less than one quality control sample per 10 field samples was collected, this objective is violated.

3.0 Field Blank: Field blanks were prepared at the DWM Worcester Office. Reagent grade water was transported into the field where it was transferred into a sample container and fixed using the same method as its corresponding field sample. All blanks were submitted to WES laboratory "blind". If the field blanks were significantly different (>2 standard deviations [9]) from the detection limit, this data quality objective is violated.

4.0 Field Replicate: Two independent samples were collected from the same location and as close as possible to the same time in the field. Both samples were submitted to WES laboratory "blind". In order for this data quality objective to be met, the results must be:

<20% Relative Percent Difference (RPD) for method detection limits >1mg/L
<30% RPD for method detection limits <1mg/L

A detailed QA/QC summary of the four data quality objectives and additional DWM quality assurance observations for the 1997 Hudson River Basin data can be found in the 1997 Watershed QA/QC Assessment Report [8].

LABORATORY

Discrete water sample analysis followed EPA-approved laboratory QA/QC methodologies in accordance with WES Standard Operating Procedures [3]. The quality of data generated at WES was determined by analyzing the results of a variety of quality control procedures including but not limited to:

Low Calibration Standards – Checks the stability of the instrument's calibration curve. Analyzes the accuracy of an instrument's calibration within a 5% range.

Reference Standards – Generally, a second source standard (a standard different from the calibration stock standard) that analyzes the accuracy of an instrument's calibration within a 5% range.

Laboratory Reagent Blank/Method Blank (LRB) – Reagent grade water (de-ionized) extracted with every sample set to ensure that the system is free of target analytes (< MDL).

Duplicate Sample – Measures the precision (% Relative Percent Difference) of the extraction and analytical process. The acceptable laboratory %RPD range is typically ≤ 25%.

Spike Sample (Laboratory Fortified Blank - LFB and Laboratory Fortified Matrix - LFB)– Measures the accuracy (% Recovery) of an analytical method. The acceptable laboratory % recovery range is typically between 80 – 120% for LFB samples and 70 – 130% for LFM discrete water samples.

The WES Laboratory is solely responsible for the administration of its Quality Assurance Program and Standard Operating Procedures. The frequency of the laboratory's quality control procedure was at times inconsistent with their Quality Assurance Plan [3]. In these circumstances additional quality assurance procedures were used. Refer to WES's Quality Assurance Plan [3] for specific laboratory analytical QA/QC criteria. WES laboratory releases discrete water sample data when their established QA/QC criteria are met or the data are labeled as outside of these criteria.

A.1.2 Fish Tissue Data

Fish were collected and processed according to DWM's Quality Assurance Project Plan [4]. Tissue preparation and analysis strictly adhered to EPA-approved laboratory QA/QC methodologies in accordance with WES Standard Operating Procedures [6,7]. The quality of tissue data generated at WES was determined by incorporating a variety of quality control samples:

Laboratory Reagent Blank/Method Blank (LRB) – Clean clam tissue matrix extracted with every sample set to ensure that the system is free of target analytes (< MDL).

Laboratory Fortified Blank (LFB) – Clean clam tissue matrix spiked with a low concentration of target compounds. LFB results are used to establish accuracy of system's performance. The acceptable laboratory % recovery range is typically 80 – 120%.

Laboratory Fortified Matrix (LFM) – Tissue matrix spiked with a low concentration of a target compound. LFM results are used to establish accuracy of the extraction and analytical process. The acceptable laboratory % recovery range is typically between 70 – 130% for metal analysis and 60 –140% for PCB/Organochlorine Pesticide analysis

Quality Control Standard (QCS) – A pre-spiked secondary tissue sample. QCS results are used to establish accuracy in the extraction and test methods. The acceptable laboratory % recovery range is typically between 80–120%.

The WES Laboratory is solely responsible for the administration of its Quality Assurance Program and Standard Operating Procedures. The frequency of the laboratory's quality control procedure was at times inconsistent with their Quality Assurance Plan [3]. In these circumstances additional quality assurance procedures were used. Refer to WES's Quality Assurance Plan [3] for specific laboratory analytical QA/QC criteria. WES laboratory releases tissue data when their established QA/QC criteria are met or the data are labeled as outside of these criteria.

A.1.3 *In-situ* Water Quality Analysis

Trained DWM staff members conducted *in-situ* measurements using a Hydrolab® Multiprobe Series 3 analyzer. The Hydrolab® Multiprobe Series 3 analyzer measures dissolved oxygen, temperature, pH, conductivity, depth and turbidity and calculates total dissolved solids and % saturation of dissolved oxygen. To ensure the quality of the *in-situ* data, the following QA/QC steps were taken:

1.0 Pre-Calibration: After each analytical probe on the Hydrolab® analyzer was calibrated, a pre-calibration check was conducted. A low ionic standard was first analyzed to check the accuracy of the instrument. Then an instrument check consisting of de-ionized water was analyzed to check the instrument for contamination. The instrument check criteria is based on de-ionized water that that had been stored and vented to the air for at least three days. If the pre-calibration check achieved the criteria in Table A.1-1 then the instrument was ready for field analysis but if the pre-calibration check failed to achieve the low ionic standard criteria than the instrument was re-calibrated and a second low ionic and instrument check was analyzed. If the instrument failed to meet the established low ionic standard criteria a second time the Hydrolab® instrument could not be used to collect data and maintenance was scheduled. Refer to the DWM Hydrolab® Standard Operating Procedure [5].

2.0 Post Survey Check: Once the Hydrolab® was returned from field sampling, a post survey check was performed to ensure that no malfunction or damage had occurred to any of the Hydrolab® probes. The low ionic standard and the instrument check were re-analyzed. If the post survey check achieved the established criteria in Table A.1-1, the data was deemed acceptable and was ready for the data reduction QA/QC step. If, however, the post calibration failed to meet the criteria, the Hydrolab® Coordinator investigated the cause and recommended censoring of affected data to the Database Manager.

3.0 Data Reduction: The Hydrolab® Coordinator and Database Manager reviewed the Hydrolab® data for instability, instrument malfunction, operator technique and aberrant trends. If any of these conditions were detected, the data was investigated and may have been recommended for censoring. The Database Manager electronically tagged all data recommended for censoring in the database.

Table A.1-1 Hydrolab® Multiprobe Series 3 analyzer pre and post calibration specifications.

Hydrolab® Analyte	**Low-Ionic Standard**	**Instrument Check ***
Dissolved Oxygen	Saturation Chart (dependant on temperature & barometric pressure)	
pH	6.90 ±1%	5.6 ±0.2 units
Specific Conductance	74 ±1%	1.0 ±1%
Turbidity	0.0 ±5%	0.0 ±5%
Temperature	Ambient ±0.15°C**	Ambient ±0.15°C**
Depth	Field Calibrated ±0.45m	Field Calibrated ±0.45m
Salinity	Not Applicable	0.0 ±0.2ppt
Redox	Not Applicable	0.0±20mV

* Based on Division of Watershed Management's filtered de-ionized water
** Compared to the DWM laboratory's wall thermometer

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A.2 QA/QC Data

Field blank and replicate sampling results for the discrete water quality sampling (physico/chemical and bacteriological) are provided in Tables A.2-1 through A.2-4. Tables A.2-5 and A.2-6 contain laboratory QA/QC data for organics in tissue analyses and metals in tissue analyses, respectively.

Table A.2-1. 1997 DEP DWM Hudson River Basin instream physico/chemical QA/QC field blank data. (All units expressed in mg/L unless otherwise specified.)

			Time (24hr)	Alkalinity	Hardness	Specific Conductivity (umhos)	Chloride	Suspended Solids	Total Solids	Turbidity (NTU)	Total Kjeldahl Nitrogen	Ammonia	Nitrate	Total Phosphorus
Field Blank Sample														
11-0002	BLANK	7/8/97	9:55	2.0	0.8	--	<1.0	<2.5	--	**	--	<0.02	<0.02	<0.01
11-0009	BLANK	7/8/97	10:40	4.0	<0.66	--	<1.0	<2.5	--	**	--	<0.02	<0.02	<0.01
11-0017	BLANK	8/12/97	**	3.0	<0.66	--	1.0	<2.5	--	<0.1	--	<0.02	<0.02	<0.01
11-0025	BLANK	8/12/97	**	3.0	<0.66	--	1.0	<2.5	--	<0.1	--	<0.02	<0.02	<0.01
11-0031	BLANK	9/16/97	10:50	3.0	<0.66	--	<1.0	<2.5	--	0.10	--	<0.02	<0.02	<0.01
11-0036	BLANK	9/16/97	10:57	2.0	<0.66	--	<1.0	<2.5	--	0.10	--	<0.02	<0.02	<0.01

Table A.2-2. 1997 DEP DWM Hudson River Basin instream physico/chemical QA/QC field replicate data. (All units expressed in mg/L unless otherwise specified.)

			Time (24hr)	Alkalinity	Hardness	Specific Conductivity (umhos)	Chloride	Suspended Solids	Total Solids	Turbidity (NTU)	Total Kjeldahl Nitrogen	Ammonia	Nitrate	Total Phosphorus
HOOSIC RIVER, Station: HR08A														
11-0014	11-0015	8/12/97	9:49	78	77	--	13	<2.5	--	0.80	--	0.03	0.03	0.03
11-0015	11-0014	8/12/97	9:49	78	76	--	12	<2.5	--	0.80	--	0.04	0.03	0.02
Relative Percent Difference (RPD):				*0.0%*	*1.3%*		*8.0%*	*0.0%*		*0.0%*		*28.6%*	*0.0%*	*40.0%*
HOOSIC RIVER, Station: HR07A														
11-0028	11-0029	9/16/97	9:57	123	134	--	22	<2.5	--	0.80	--	<0.02	0.45	0.01
11-0029	11-0028	9/16/97	9:57	127	140	--	22	<2.5	--	0.80	--	<0.02	0.44	0.01
Relative Percent Difference (RPD):				*3.2%*	*4.4%*		*0.0%*	*0.0%*		*0 0%*		*0.0%*	*2.2%*	*0.0%*
HOOSIC RIVER, Station: HR07														
11-0004	11-0005	7/8/97	11:50	101	90	--	18	11	--	**	--	0.19	0.36	0.04
11-0005	11-0004	7/8/97	11:50	101	105	--	18	12	--	**	--	0.24	0.37	0.03
Relative Percent Difference (RPD):				*0.0%*	*15.4%*		*0.0%*	*8.7%*				*23.3%*	*2.7%*	*28.6%*
HOOSIC RIVER, Station: HR03D														
11-0010	11-0011	7/8/97	11:30	117	126	--	23	5.2	--	**	--	0.12	0.54	0.05
11-0011	11-0010	7/8/97	11:30	117	125	--	23	7.0	--	**	--	0.13	0.55	0.03
Relative Percent Difference (RPD):				*0.0%*	*0.8%*		*0.0%*	*29.5%*				*8.0%*	*1.8%*	*50.0%*
HOOSIC RIVER, Station: HR02														
11-0037	11-0038	9/16/97	11:25	126	141	--	25	4.4	--	1.1	--	0.37	0.44	0.07
11-0038	11-0037	9/16/97	11:38	126	142	--	25	4.4	--	1.1	--	0.37	0.44	0.07
Relative Percent Difference (RPD):				*0.0%*	*0.7%*		*0.0%*	*0.0%*		*0.0%*		*0.0%*	*0.0%*	*0.0%*
GREEN RIVER, Station: GN01														
11-0021	11-0022	8/12/97	10:20	102	103	--	9.0	<2.5	--	0.90	--	<0.02	0.35	0.01
11-0022	11-0021	8/12/97	10:20	102	104	--	9.0	<2.5	--	0.80	--	<0.02	0.33	0.01
Relative Percent Difference (RPD):				*0.0%*	*1.0%*		*0.0%*	*0.0%*		*11.8%*		*0.0%*	*5.9%*	*0.0%*

** = missing/censored data -- = no data

Table A.2-3. 1997 DEP DWM Hudson River Basin instream bacteriological QA/QC field blank data. (Units expressed in colonies/100ml.)

Sample Id			Time (24hr)	FECAL	E-COLI	ENTEROCOCCUS	AEROMONAS
Field Blank Sample							
11-0002	BLANK	7/8/97	9:55	<20	<20	--	--
11-0009	BLANK	7/8/97	10:40	<20	<20	--	--
11-0017	BLANK	8/12/97	**	**	--	--	--
11-0025	BLANK	8/12/97	**	**	--	--	--
11-0031	BLANK	9/16/97	10:50	<20	<20	--	--
11-0036	BLANK	9/16/97	10:57	<20	<20	--	--

** = missing/censored data -- = no data

Table A.2-4. 1997 DEP DWM Hudson River Basin instream bacteriological QA/QC field replicate data (units in colonies/100 ml, data log10 transformed).

Sample Id	Sample Id		Time (24hr)	FECAL	E-COLI	ENTEROCOCCUS	AEROMONAS
HOOSIC RIVER, Station: HR08A							
11-0014	11-0015	8/12/97	9:49	**	--	--	--
11-0015	11-0014	8/12/97	9:49	**	--	--	--
Relative Percent Difference (RPD):							
HOOSIC RIVER, Station: HR07A							
11-0028	11-0029	9/16/97	9:57	**	**	--	--
11-0029	11-0028	9/16/97	9:57	**	**	--	--
Relative Percent Difference (RPD):							
HOOSIC RIVER, Station: HR07							
11-0004	11-0005	7/8/97	11:50	3.000	2.505	--	--
11-0005	11-0004	7/8/97	11:50	3.079	2.380	--	--
Relative Percent Difference (RPD):				*2.6%*	*5.1%*		
HOOSIC RIVER, Station: HR03D							
11-0010	11-0011	7/8/97	11:30	3.041	2.301	--	--
11-0011	11-0010	7/8/97	11:30	2.778	2.415	--	--
Relative Percent Difference (RPD):				*9.0%*	*4.8%*		
HOOSIC RIVER, Station: HR02							
11-0037	11-0038	9/16/97	11:25	2.301	<1.301	--	--
11-0038	11-0037	9/16/97	11:38	2.477	1.301	--	--
Relative Percent Difference (RPD):				*7.4%*	*0.0%*		
GREEN RIVER, Station: GN01							
11-0021	11-0022	8/12/97	10:20	**	--	--	--
11-0022	11-0021	8/12/97	10:20	**	--	--	--
Relative Percent Difference (RPD):							

** = missing/censored data -- = no data

Table A.2-5. 1997 DEP DWM Hudson River Basin laboratory QA/QC data for organics in tissue analyses. (Data expressed in µg/g wet weight unless otherwise noted.)

ANALYTE	ACCURACY						MINIMUM DETECTION LIMIT
	Blank #1 (5/26 - 9/29/98)	Blank #2 (5/29 - 9/29/98)	Blank #3 (6/1 - 9/29/98)	Laboratory Spike #1 (5/28 - 9/29/99)			
% Lipid	0.51	0.08	0.21	0.41			
				EXPECTED	LFM	RECOVERY (%)	
PCB A1242	ND	ND	ND	ND	ND	ND	0.06
PCB A1254	ND	ND	ND	ND	ND	ND	0.17
PCB A1260	ND	ND	ND	ND	ND	ND	0.16
Chlordane	ND	ND	ND	ND	ND	ND	0.11
Toxaphene	ND	ND	ND	2.5	3.0	120	0.11
a-BHC	ND	ND	ND	ND	ND	ND	0.0062
b-BHC	ND	ND	ND	ND	ND	ND	0.0019
Lindane	ND	ND	ND	ND	ND	ND	0.0059
d-BHC	ND	ND	ND	ND	ND	ND	0.020
Hexachlorocyclopentadiene	ND	ND	ND	ND	ND	ND	0.0077
Trifluralin	ND	ND	ND	ND	ND	ND	0.0062
Hexachlorobenzene	ND	ND	ND	ND	ND	ND	0.0091
Heptachlor	ND	ND	ND	ND	ND	ND	0.012
Heptachlor Epoxide	ND	ND	ND	ND	ND	ND	0.030
Methoxychlor	ND	ND	ND	ND	ND	ND	1.07
DDD	ND	ND	ND	ND	ND	ND	0.0052
DDE	ND	ND	ND	ND	ND	ND	0.015
DDT	ND	ND	ND	ND	ND	ND	0.0083
Aldrin	ND	ND	ND	ND	ND	ND	0.0075

ND - not detected or the analytical result is at or below the established minimum detection limit (MDL).
REMARKS: The samples were extracted and analyzed according to the modified AOAC 983.21 procedure for the analysis of PCBs and Organochlorine Pesticides.

Table A.2-6. 1997 DEP DWM Hudson River Basin laboratory QA/QC data for metals in tissue analyses. (Data expressed in mg/kg wet weight unless otherwise noted.)

Sample ID	Analyte	Precision			Accuracy			Accuracy* (% Recovery)		MDL	Analytical Method
		Sample	Duplicate	RPD	LFM	Spike Amount	Recovery (%)	LFB	QCS		
97-3108	As	<MDL	<MDL	NA	1.78	2.0	89	92	95	0.040	EPA 200.9
97-3108	Pb	<MDL	<MDL	NA	18.0	20.0	90	93	98	0.140	EPA 200.7
97-3108	Se	0.184	0.203	9.8%	1.88	2.0	94	103	84	0.040	EPA 200.9
97-3108	Cd	<MDL	<MDL	NA	20.8	20.0	104	102	93	0.020	EPA 200.7
97-3108	Hg	0.16	0.16	0.0%	0.171	0.18	95	97	112	0.020	EPA 245.6

LFB - Laboratory Fortified Blank
LFM - Laboratory Fortified Matrix
MDL - Minimum Detection Limit
NA - Not Applicable
QCS - Quality Control Sample
RPD - Relative Percent Difference
*see Appendix A section A.1.2. for further details

A.3 Analytical Methods

Discrete Water Sample Analytes	EPA Method*	SM Methods**	Other Methods
Fecal Coliform		SM 9222D	
E. Coli, MTEC		SM 9213D	
Alkalinity (titrimetric)	EPA 310.1	SM 2320B	
Chloride (titrimetric)		SM 4500CL⁻B	
Hardness (EDTA)	EPA 130.2	SM 2340B	
Turbidity	EPA 180.1	SM 2130B	
Ammonia-N (Automated – phenate)	EPA 350.1	SM 4500-NH_3-H	
Nitrate/Nitrite-N (automated – hydrazine)	EPA 353.1	SM 4500 –NO_3 -H	
Total Phosphorus	EPA 365.2	SM 4500P-E	
Suspended Solids		SM 2540D	
Fish Tissue Analytes			
PCB Arochlor 1242			AOAC 983.21***
PCB Arochlor 1254			"
PCB Arochlor 1260			"
Chlorodane			"
Toxaphene			"
a-BHC			"
b-BHC			"
Lindane			"
d-BHC			"
Hexachlorocyclepentadiene			"
Trifluralin			"
Hexachlorobenzene			"
Heptachlor			"
Heptachlor Epoxide			"
Methoxychlor			"
DDD			"
DDE			"
DDT			"
Aldrin			"
Arsenic (STGFAA)	EPA 200.9	SM 3113	
Lead (ICP)	EPA 200.7	SM 3120B	
Selenium (STGFAA)	EPA 200.9	SM 3113	
Cadmium (ICP)	EPA 200.7	SM 3120B	
Mercury (cold vapor)	EPA 245.1	SM 3112B	

* = "Methods for Chemical Analysis of Water and Wastes", Environmental Protection Agency, Environmental Monitoring Systems Laboratory – Cincinnati (EMSL-CI), EPA-600/4-79-020, Revised March 1983 and 1979 where applicable.
** = Standard Methods, Examination of Water and Wastewater, 20th edition
***= PCBs and Organochlorine Pesticides in Biological Tissue, AOAC Official Methods of Analysis, 1990.

APPENDIX B - 1997 DEP HUDSON RIVER BASIN SURVEY DATA

MATERIALS AND METHODS

The DWM began sampling in July 1997 and continued through September 1997. The DWM sampling plan matrix is summarized in Table B1. Sampling components at river stations included: stream discharge measurements, *in-situ* Hydrolab™ measurements, physico-chemical and nutrient sampling, fecal coliform bacteria sampling, benthic macroinvertebrate and fish population sampling, and toxics in fish flesh. Synoptic surveys of lakes were conducted during August 1997 to coincide with the maximum extent of macrophyte growth. Each sampling component is described in the sections that follow.

Table B1. 1997 Hudson River Basin Surveys DEP-DWM sampling matrix.

STREAM NAMES	STATION[1]	1997 JULY	1997 AUG	1997 SEPT
HOOSIC RIVER SUBBASIN				
Hoosic River	HR08A (Q0023)	B, H, N, C, Q	B, H, N, C	B, H, N, C
	HR08B (Q0024)		Q	Q
	HR07A (HR07U)	B, H, N, C	B, H, N, C, M	B, H, N, C
	MA0100315	C	C	C
	HR07D		M	
	HR07 (Q0025)	B, H, N, C, Q	B, H, N, C, Q	B, H, N, C, Q
	F0052		T	
	HR03	B, H, N, C	B, H, N, C	B, H, N, C
	HR03D	B, H, N, C	B, H, N, C	B, H, N, C
	HR03		M	
	MA0100510	C	C	C
	HR02		M	
	HR02 (Q0028)	B, H, N, C, Q	B, H, N, C, Q	B, H, N, C, Q
Bassett Brook	BB00		F	M
Pecks Brook	PB00		F	M
North Branch Hoosic River	F0051		T	
	HR09A (Q0026)	B, H, N, C, Q	B, H, N, C, Q	B, H, N, C, Q
	F0050		T	
Green River	GN04		M, F	
	GN03		M,	
	upstream of Blair Road, Williamstown		F	
	GN02		M	
	GN01	B, H, N, C	B, H, N, C, M, F	B, H, N, C
East Branch Green River	GE01		M	
West Branch Green River	GW01		M	
KINDERHOOK SUB BASIN				
Kinderhook Creek	KC01		M, F	
	KC02		M, F	

[1] Sampling did not necessarily occur at the same exact location although that which occurred in the general vicinity of the sampling station is listed together.

B=Bacteria (fecal coliform, E. coli); H=Hydrolab™ multiprobe meter (pH, dissolved oxygen, conductivity, temperature, total dissolved solids); N=Nutrients (total phosphorus, ammonia, nitrate-nitrogen); C=Chemistry (alkalinity, hardness, chlorides, total suspended solids, turbidity); M=Macroinvertebrate kick sampling, habitat assessment, and algae/periphyton sampling; F = Fish population sampling, Q = Stream discharge measurements. T = Toxics in fish tissue (Cd, Pb, Hg, As, Se, % lipids, PCBs, organochlorine pesticides).

Survey Conditions

Conditions prior to each survey were characterized by analyzing precipitation and streamflow data. The closest weather station precipitation gage, Crane & Company Dalton Station #104, was used to determine precipitation and weather conditions in the five days prior to and on the sampling dates. Data from this station were provided by the DEM Office of Water Resources (MA DEM 1998). Discharge

(hereinafter referred to as streamflow) and duration data were obtained from three continuous USGS stream gages in the basin (Figure B1), Hoosic River at Adams (01331500) and at Williamstown (01332500) and the Green River at Williamstown (01333000). Streamflow statistics for the period-of-records for these gages are available from USGS. These data can be found in their *Water Resources Data Massachusetts and Rhode Island, Water Year 1997* report (Socolow *et al.* 1998) and the *Gazetteer of Hydrologic Characteristics of Streams in Massachusetts—Hudson River Basin* (Wandle 1984). The period of record (POR) for the Hoosic River gage at Adams is from October 1931 to present, the Hoosic

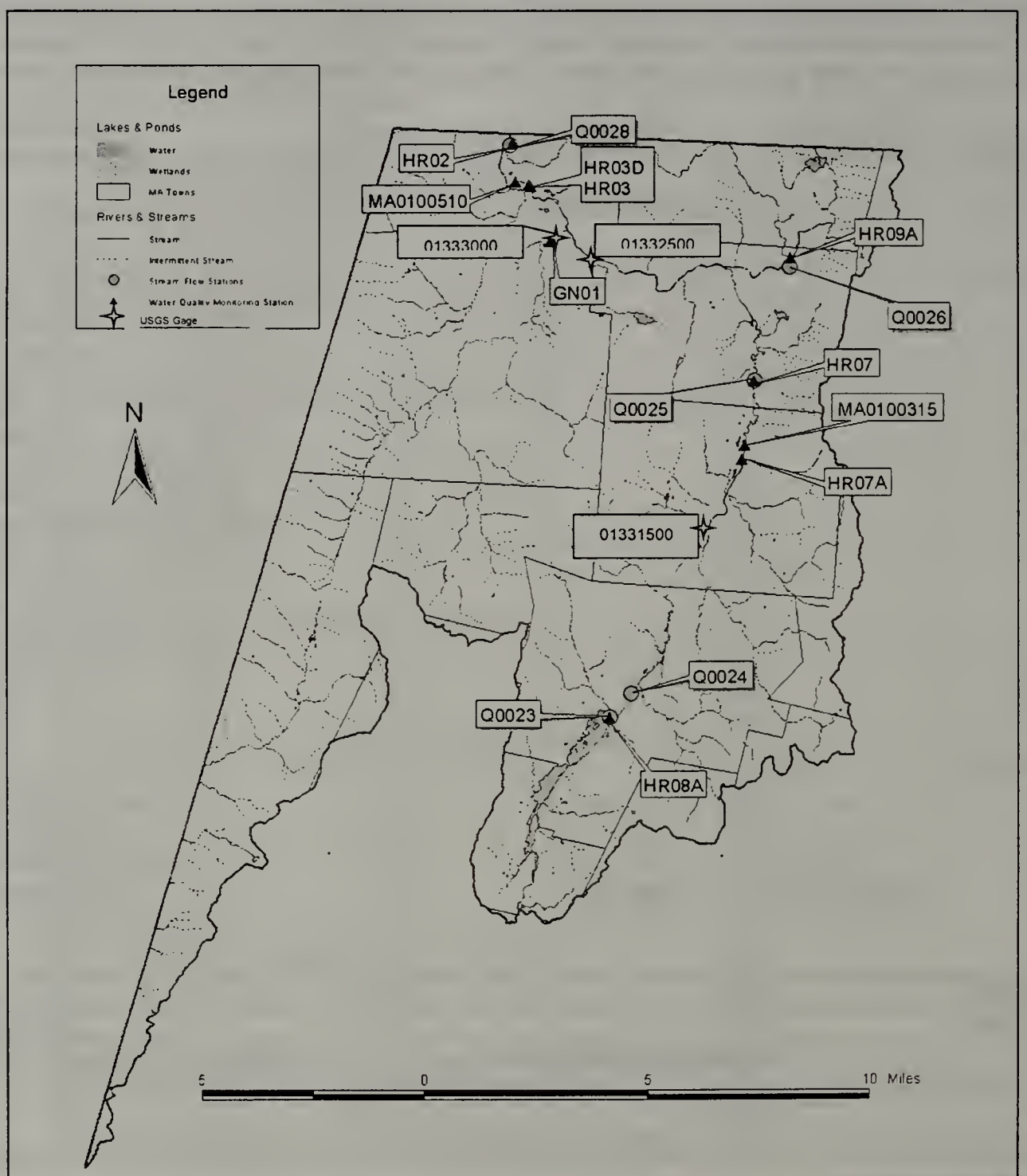

Figure B1. Location of 1997 water quality, stream discharge, and USGS gaging stations in the Hoosic River Subbasin.

River at Williamstown is from July 1940 to present, and the Green River at Williamstown is from September 1949 to present. Stream discharge was also measured by DEP at selected locations to supplement the USGS gaging station data (Figure B1).

Stream Water Quality Monitoring

Water quality sampling was conducted at the stations identified in Figure B1. Synoptic water quality sampling at these locations included the following: *in-situ* measurements using a Scout 2 Hydrolab™ multiparameter meter (water temperature, dissolved oxygen, conductivity, total dissolved solids, and pH), bacteria sampling (fecal coliform), physico-chemical sampling (alkalinity, hardness, specific conductivity, chloride, total and suspended solids, and turbidity), and nutrient sampling (ammonia and nitrate nitrogen and total phosphorus).

Procedures used for water sampling and sample handling are described in the *Basin Program Standard Operating Procedures* (MA DEP 1989). The Wall Experiment Station (WES), the Department's analytical laboratory, supplied all sample bottles and field preservatives, which were prepared according to the WES *Laboratory Quality Assurance Plan and Standard Operating Procedures* (MA DEP 1994). Samples were preserved in the field as necessary, transported on ice to WES, and analyzed according to the WES SOP. The quality control protocol that was followed for field and equipment blank samples is described in Appendix A of this report (*Hudson River Basin 1997 Water Quality Assessment Report)*. Both quality control samples (field blanks, trip blanks, and split samples) and raw water quality samples were transported on ice to WES on each sampling date; they were analyzed subsequently according to the WES SOP (MA DEP 1994).

Macroinvertebrates

A technical memorandum by Robert Nuzzo of DEP DWM entitled *Hudson River Watershed (Kinderhook Creek and Hoosic River Subwatersheds) 1997 Biological Assessments* presents the aquatic macroinvertebrate analysis of samples collected from selected sites (Figure B2) in the Hoosic River Subbasin. This memorandum is provided in Appendix C of this report (*Hudson River Basin 1997 Water Quality Assessment Report).*

Fish Population

The DWM conducted fish population surveys in the Hoosic River Subbasin during the summer of 1997. In addition, two stations were sampled in the Kinderhook Subbasin on Kinderhook Creek. The Kinderhook Creek stations were located above and below a permitted surface water withdrawal for Jiminy Peak Ski Area. Hoosic River Subbasin surveys were conducted on the Green River (5 stations), Peck's Brook (1 station), and Bassett Brook (1 station). Surveys were conducted using techniques similar to Rapid Bioassement Protocols V (fish) as described by Plafkin (1989). Surveys also included a habitat assessment component.

Fish populations were sampled by electroshocking using a Smith Root Model 12 battery powered backpack electrofisher. A reach of approximately 100m was sampled by passing a pole mounted anode ring, side to side through the stream channel and in and around likely fish holding cover. All fish shocked were netted and held in buckets. Sampling proceeded from an obstruction or constriction, upstream to an endpoint at another obstruction or constriction such as a waterfall or shallow riffle. Following completion of a sampling run, all fish were identified to species, counted, and released.

Fish Toxics

Uniform protocols, designed to assure accuracy and prevent cross-contamination of samples, were followed for collecting, processing and shipping fish collected via electroshocking. Fish were collected from the North Branch Hoosic River and the Hoosic River on 11 August and 26 August 1997 (Figure B2). Lengths and weights were measured and fish were visually inspected for tumors, lesions, or other anomalies. Fish included in the samples were placed in ice filled coolers and were processed in the field. Scale samples were obtained from each sample to determine the age of the fish. Fish were filleted (skin off) on glass cutting boards and prepared for freezing. All equipment used in the filleting process was rinsed in cold water to remove slime, scales, and other fluids such as blood, then re-rinsed twice in deionized water before (and/or after) each sample. Individual fillets were wrapped in aluminum foil or stored in the single sample container, whereas two to three fillets from like-sized individuals of the same

species (composite sample) were wrapped together in aluminum foil or stored in the single sample container. Fillets targeted for metals analysis were placed in VWR 32-ounce high-density polyethylene (HDPE) cups with covers. The opposite fillets were wrapped in aluminum foil for % lipids, PCBs and organochlorine pesticide analysis. Samples were tagged and frozen for subsequent delivery to WES.

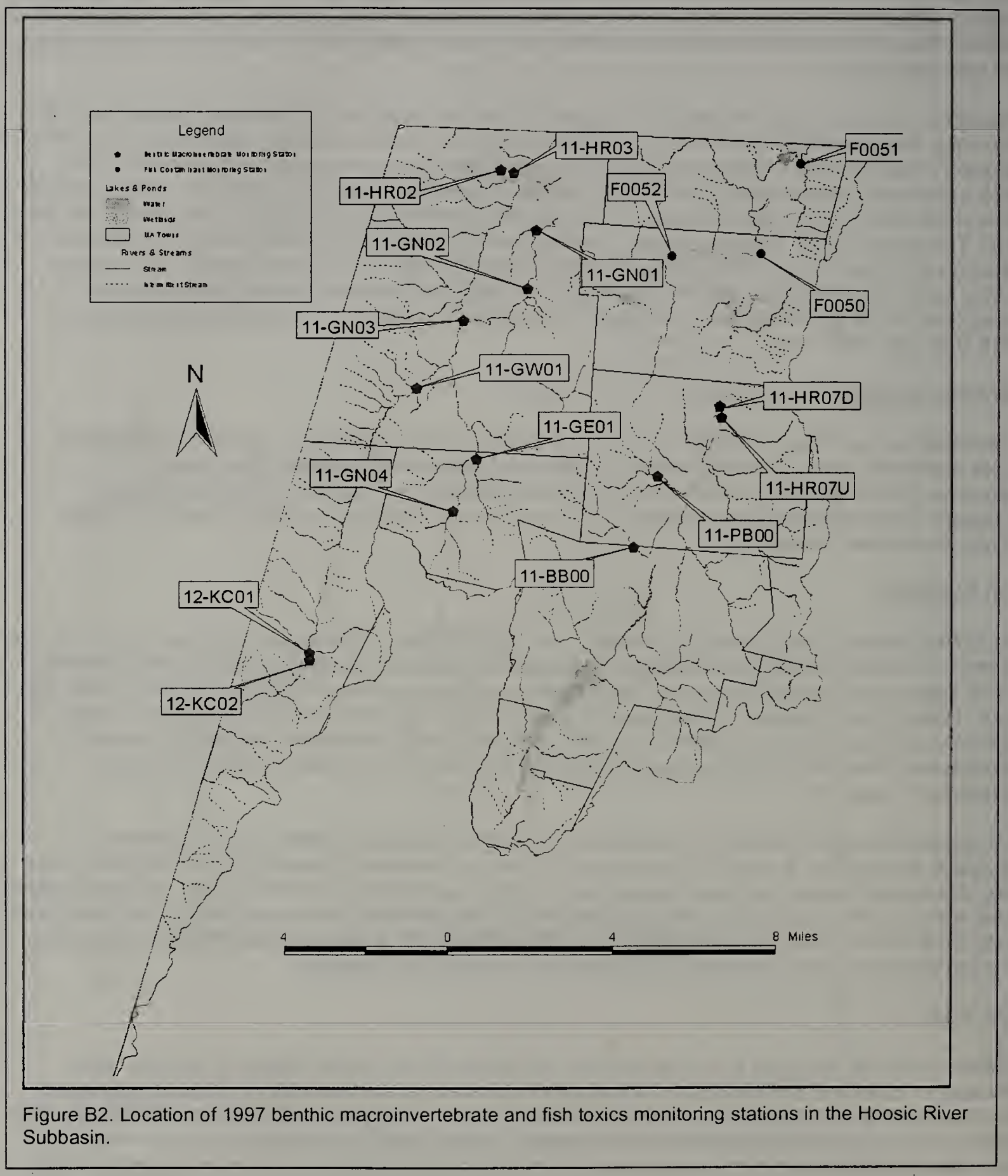

Figure B2. Location of 1997 benthic macroinvertebrate and fish toxics monitoring stations in the Hoosic River Subbasin.

Methods used at WES for analyzing metals include the cold vapor method using a VGA hydride generator for mercury and Varian 1475 flame atomic absorption for all remaining metals (MA DEP 1994).

PCB/organochlorine pesticides analyses were performed on a gas chromatograph equipped with an electron capture detector.

Lakes

Synoptic lake surveys were conducted during August 1997. Synoptic surveys consisted of taking observations from at least one access point on each lake (multiple access points on larger lakes). At each lake, an attempt was made to observe the entire surface area to determine the extent of areal macrophyte cover.

At each observation site the general water quality was noted and all aquatic and wetland macrophyte species were recorded along with their general abundance and an estimate of the total percent areal coverage of all species. Qualitative macrophyte observations were aided by conducting several hauls with a plant "rake," which was constructed by bolting two garden rakes back-to-back, the handles cut to about half length, and then attached to about a 50' length of rope. Each time the rake was thrown to its maximum extension and then retrieved along the lake bottom. The rake was thrown several times in different directions from the observation site to provide more thorough coverage.

Where possible, transparency was measured using a standard 20-centimeter diameter Secchi disc attached to a rope with metric calibrations. When Secchi disc measurements were not feasible, transparency was estimated as being above or below 1.2 meters (based on the 4 foot Secchi disc bathing beach standard).

All observations were recorded on standardized field sheets. Assessments of trophic status and use impairment were made on site. Later, the assessments and supporting information were entered into the US EPA Water Body System database. Data on the presence of non-native plants were entered into a separate database intended for linking to the Massachusetts Geographic Information System (MassGIS).

RESULTS

Survey conditions

To fulfill the assessment guidance, information on precipitation (MA DEM 1998) and stream discharge (Socolow *et al.* 1998) and stream discharge measurements (Table B2) were analyzed to determine hydrologic conditions during the water quality sampling events. This review was conducted to determine the streamflow condition in relation to the 7-day, 10-year (7Q10) low flow. Additionally, this review was used to determine whether the fecal coliform bacteria data were representative of "wet" or "dry weather" sampling conditions. Survey conditions are described below for each DWM sampling event reviewed for the assessment (MA DEP 1997a).

8 July 1997: Thunder showers/high winds preceded the 8 July 1997 sampling event on the Hoosic River apparently between 3 and 4 July 1997 (Figure B3). Some precipitation was measured on 8 July (MA DEM 1998), however field sheet notes (MA DEP 1997) indicated the day of sampling was sunny and clear. The daily mean stream discharge of the Hoosic River USGS gage at Adams (01331500) (Socolow *et al.* 1998) reflected precipitation (increase from 37 to 70 cfs between 7 and 8 July) however, the storm occurred after the sampling. Interpretation of the 8 July 1997 data for the assessment will be " dry weather" conditions. Streamflow of the Hoosic River was between 2 and 3 times higher than 7Q10 conditions (calculated using the mean discharge reported in Socolow, *et al.* 1998 on 7 July -- prior to the storm event which occurred after the sampling).

12 August 1997: Much lower flow conditions occurred during the 12 August 1997 sampling event. No antecedent rainfall was recorded at the Dalton station until 12 August (0.42 inches of precipitation) (MA DEM 1998). The daily mean discharge of the Hoosic River on 12 August was 23 cfs at the Adams gage and 56 cfs at the Williamstown gage (Socolow *et al.* 1998). The flow was below the monthly mean at both gage locations over the period of record and was approximately 1.5 to 1.8 times higher than the 7Q10 condition. Data collected during the 12 August 1997 survey will be interpreted as being representative of "dry" conditions.

16 September 1997: Mean daily discharge of the Hoosic River at the Adams gage was 17 cfs and at the Williamstown gage was 55 cfs (Socolow *et al.*, 1998). The flow was well below the average September flows over the period of record. The river was also slightly lower than the 12 August survey but still exceeded 7Q10 conditions (1.3-1.4 times higher). Although 0.39 inches of rain were recorded at the Dalton station (MA DEM 1998), no discernable affects on streamflow were observed. The 16 September data will be interpreted as "dry weather" conditions.

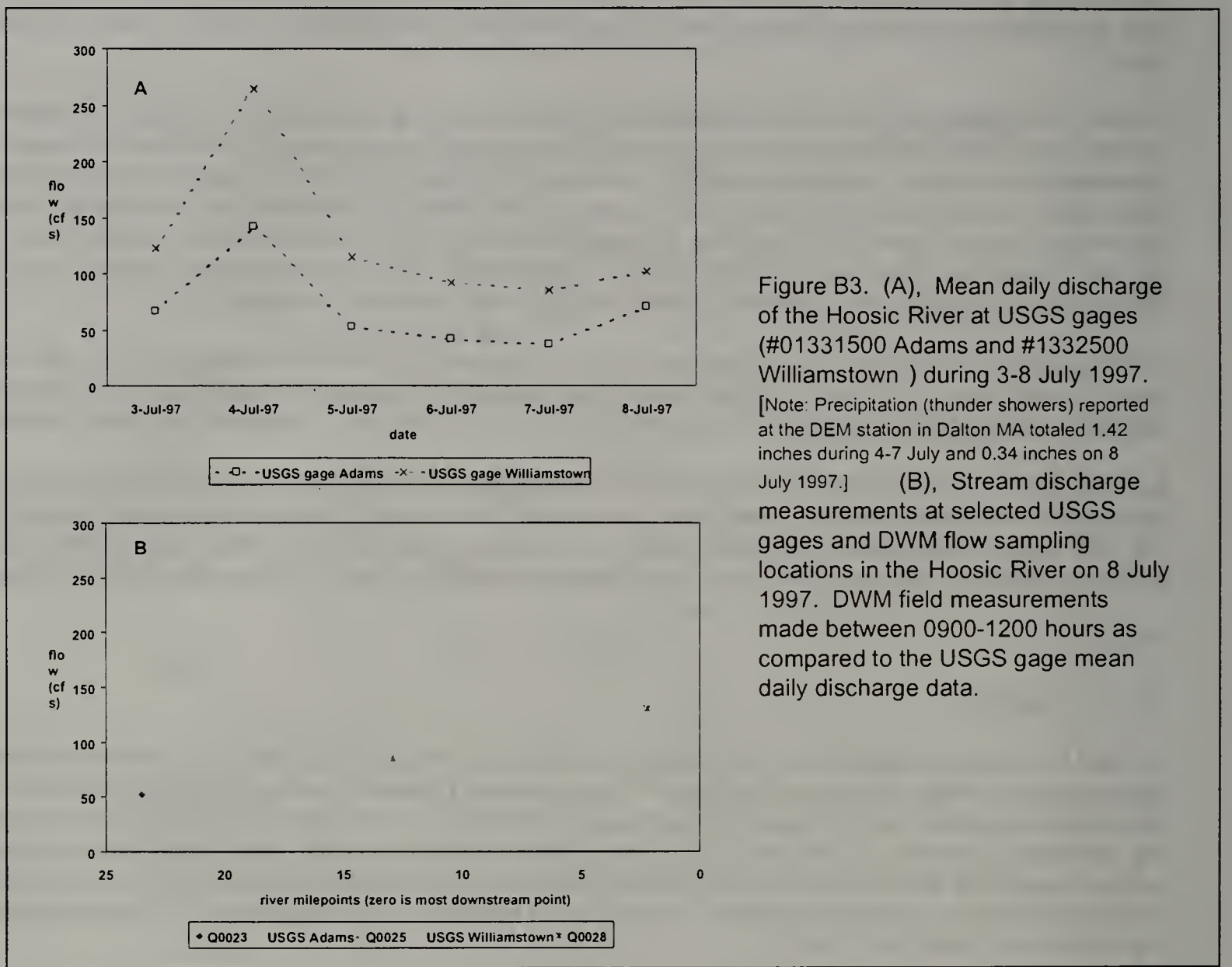

Figure B3. (A), Mean daily discharge of the Hoosic River at USGS gages (#01331500 Adams and #1332500 Williamstown) during 3-8 July 1997. [Note: Precipitation (thunder showers) reported at the DEM station in Dalton MA totaled 1.42 inches during 4-7 July and 0.34 inches on 8 July 1997.] (B), Stream discharge measurements at selected USGS gages and DWM flow sampling locations in the Hoosic River on 8 July 1997. DWM field measurements made between 0900-1200 hours as compared to the USGS gage mean daily discharge data.

Table B2. 1997 DEP DWM Hudson River Basin, Hoosic River Subbasin stream discharge measurements.

	Time (24hr)	Collecting Agency	Sampling Technique	Velocity (fps)	Discharge (cfs)
HOOSIC RIVER					
Station: HR08A,					
Description: outlet Cheshire Reservoir (near Lakeside Restaurant and Route 8), Cheshire.					
7/8/97	9:10	DEP	Swoffer 2100	0.51	52.5e
HOOSIC RIVER					
Station: HR08B					
Description: downstream/northeast of outlet of Cheshire Reservoir at first bridge crossing at Church Street, Cheshire.					
8/12/97	9:50	DEP	Swoffer 2100	1.1	11.2e
9/16/97	9:30	DEP	Swoffer 2100	0.98	10.2
HOOSIC RIVER					
Station: HR07					
Description: just upstream/south of Hodges Cross Road, North Adams. (downstream/north of Adams WWTP)					
7/8/97	10:30	DEP	Swoffer 2100	1.3	84.5
8/12/97	11:25	DEP	Swoffer 2100	0.75	37.4e
9/16/97	10:45	DEP	Swoffer 2100	0.68	31.8e
HOOSIC RIVER					
Station: HR02					
Description: west of Route 7, Williamstown. (downstream/north of Hoosac Valley WWTP)					
7/8/97	12:00	DEP	Unknown	1.0	130
8/12/97	13:15	DEP	Swoffer 2100	0.79	79.6
9/16/97	12:50	DEP	Swoffer 2100	0.46	66.3
NORTH BRANCH HOOSIC RIVER					
Station: HR09A					
Description: approximately 150 yards upstream/east of first bridge crossing of Route 8 (Beaver Street), North Adams.					
7/8/97	**	DEP	Swoffer 2100	0.58	6.86e
8/12/97	15:35	DEP	Swoffer 2100	0.51	5.27e
9/16/97	14:45	DEP	Swoffer 2100	0.58	8.28e

** = missing/censored data e = flow estimated see field sheet for details

All DEP water quality data is managed and maintained in an Access Database (Dallaire 1999). The Hydrolab *in-situ* results are provided in Table B3. Discrete water sampling data includes physico-chemical (Table B4) and bacterial data (Table B5).

Table B3. 1997 DEP DWM Hudson River Basin, Hoosic River Subbasin Survey, *in-situ* Hydrolab data.

		Time (24h)	Measurement Depth (m)	Temp (°C)	pH (SU)	Cond (uS/cm)	TDS (g/l)	DO (mg/l)	SAT (%)	Turb (NTU)
HOOSIC RIVER										
Station: HR08A, Mile Point: 22.1										
Description: downstream/east at Route 8 near outlet Cheshire Reservoir, Cheshire.										
11-0001	7/8/97	10:06	<0.3	22.7	9.3	187	0.1	6.8	77	--
11-0014	8/12/97	09:54	0.4	22.8	8.5	197	0.1	**	**	--
11-0027	9/16/97	08:50	<0.3	19.3	8.3	203	0.1	6.1	65	7
HOOSIC RIVER										
Station: HR07A, Mile Point: 14										
Description: approximately 50 feet upstream/south of Lime Street bridge, Adams.										
11-0003	7/8/97	11:04	<0.3	20.5	8.3	233	0.1	9.8	107	--
11-0016	8/12/97	10:48	<0.3	19.9	8.7	303	0.2	10.8	116	--
11-0028	9/16/97	10:00	<0.3	16.4	8.5	313	0.2	11.5	115	1
HOOSIC RIVER										
Station: HR07, Mile Point: 11.5										
Description: upstream/south at Hodges Cross Road bridge, North Adams.										
11-0004	7/8/97	11:52	<0.3	20.0	8.1	274	0.2	9.2	99	--
11-0018	8/12/97	11:31	0.3	20.1	8.2	375	0.2	9.1	98	--
11-0030	9/16/97	10:44	<0.3	18.4	8.1	397	0.3	9.3	97	**
HOOSIC RIVER										
Station: HR03, Mile Point: 2										
Description: approximately 1000 feet upstream/east of Route 7 bridge, Williamstown.										
11-0023	8/12/97	11:08	<0.3	22.6	8.2	360	0.2	8.2	92	8
11-0035	9/16/97	10:59	0.3	19.3	8.3	347	0.2	9.4	100	--
HOOSIC RIVER										
Station: HR03D, Mile Point: 1.9										
Description: approximately 10 feet downstream/west of Route 7 bridge, Williamstown.										
11-0011	7/8/97	11:33	<0.3	19.9	8.2	325	0.2	9.8	105	**

* = outside calibrated range, ** = censored data, -- = no data

Table B3. 1997 DEP DWM Hudson River Basin, Hoosic River Subbasin Survey, *in-situ* Hydrolab data. (Continued)

		Time (24h)	Measurement Depth (m)	Temp (°C)	pH (SU)	Cond (uS/cm)	TDS (g/l)	DO (mg/l)	SAT (%)	Turb (NTU)
HOOSIC RIVER										
Station: HR02, Mile Point: 0.3										
Description: west off Route 7 onto dirt road, cross railroad tracks to sample upstream of small unnamed tributary, Williamstown.										
11-0012	7/8/97	12:23	<0.3	20.6	8.2	322	0.2	10.0	109	**
11-0024	8/12/97	12:04	<0.3	22.9	8.5	360	0.2	10.4	118	7
11-0037	9/16/97	11:44	0.7	19.6	8.3	355	0.2	9.9	106	--
GREEN RIVER										
Station: GN01, Mile Point: 0.6										
Description: approximately 20 feet upstream/southwest of Route 2 bridge, Williamstown.										
11-0008	7/8/97	10:48	<0.3	18.2	8.5	209	0.1	10.1	105	**
11-0021	8/12/97	10:23	<0.3	19.8	8.3	239	0.2	9.4	100	17
11-0034	9/16/97	10:34	<0.3	17.4	8.5	242	0.2	10.2	104	--
NORTH BRANCH HOOSIC RIVER										
Station: HR09A, Mile Point: 2										
Description: approximately 20 feet upstream/north of Hudson Brook confluence with North Branch Hoosic River, North Adams.										
11-0006	7/8/97	13:12	<0.3	21.5	8.8	151	0.10	8.8	98	--
11-0019	8/12/97	12:34	<0.3	22.8	9.3	165	0.1	10.1	114	--
11-0032	9/16/97	11:45	<0.3	17.5	9.2	143	0.09	10.9	111	**

* = outside calibrated range, ** = censored data, -- = no data

Table B4. 1997 DEP DWM Hudson River Basin, Hoosic River Subbasin Survey, instream physico/chemical data. All units in mg/L unless otherwise noted.

			Time (24h)	Alkalinity	Hardness	Specific Conductivity (umhos)	Chloride	Suspended Solids	Total Solids	Turbidity (NTU)	Total Kjeldahl Nitrogen	Ammonia	Nitrate	Total Phosphorus
HOOSIC RIVER														
Station: HR08A, Mile Point: 22.1														
Description: downstream/east at Route 8 near outlet Cheshire Reservoir, Cheshire.														
11-0001		7/8/97	10:08	76	73	--	12	<2.5	--	**	--	<0.02	0.05	0.03
11-0014	11-0015	8/12/97	9:49	78	77	--	13	<2.5	--	0.80	--	0.03	0.03	0.03
11-0015	11-0014	8/12/97	9:49	78	76	--	12	<2.5	--	0.80	--	0.04	0.03	0.02
11-0027		9/16/97	8:55	83	85	--	14	7.4	--	1.5	--	0.02	0.06	0.02
HOOSIC RIVER														
Station: HR07A, Mile Point: 14														
Description: approximately 50 feet upstream/south of Lime Street bridge, Adams.														
11-0003		7/8/97	11:00	88	<0.66	--	15	11	--	**	--	<0.02	0.19	0.02
11-0016		8/12/97	10:46	120	127	--	19	2.8	--	0.70	--	<0.02	0.41	0.02
11-0028	11-0029	9/16/97	9:57	123	134	--	22	<2.5	--	0.80	--	<0.02	0.45	0.01
11-0029	11-0028	9/16/97	9:57	127	140	--	22	<2.5	--	0.80	--	<0.02	0.44	0.01
Pipe/Discharge to HOOSIC RIVER														
Station: MA0100315, Mile Point: 13.7														
Description: Adams WWTP outfall approximately 2000 feet downstream/north of Lime Street bridge, Adams.														
11-0007		7/8/97	12:25	180	201	--	52	--	--	**	--	--	--	--
11-0020		8/12/97	**	--	--	--	**	<2.5	--	--	--	--	--	--
11-0033		9/16/97	11:15	187	227	--	61	--	--	5.1	--	--	--	--

** = missing/censored data -- = no data

Table B4. 1997 DEP DWM Hudson River Basin, Hoosic River Subbasin Survey, instream physico/chemical data. All units in mg/L unless otherwise noted. (Continued)

			Time (24h)	Alkalinity	Hardness	Specific Conductivity (umhos)	Chloride	Suspended Solids	Total Solids	Turbidity (NTU)	Total Kjeldahl Nitrogen	Ammonia	Nitrate	Total Phosphorus
HOOSIC RIVER														
Station: HR07, Mile Point: 11.5														
Description: upstream/south at Hodges Cross Road bridge, North Adams.														
11-0004	11-0005	7/8/97	11:50	101	90	--	18	11	--	**	--	0.19	0.36	0.04
11-0005	11-0004	7/8/97	11:50	101	105	--	18	12	--	**	--	0.24	0.37	0.03
11-0018		8/12/97	**	134	150	--	23	<2.5	--	0.90	--	0.08	0.60	0.02
11-0030		9/16/97	10:41	144	164	--	26	<2.5	--	1.1	--	<0.02	0.58	0.02
HOOSIC RIVER														
Station: HR03, Mile Point: 2														
Description: approximately 1000 feet upstream/east of Route 7 bridge, Williamstown.														
11-0023		8/12/97	11:06	124	137	--	28	4.0	--	1.3	--	<0.02	0.31	0.02
11-0035		9/16/97	10:53	126	144	--	25	3.1	--	1.4	--	<0.02	0.37	0.02
HOOSIC RIVER														
Station: HR03D, Mile Point: 1.9														
Description: approximately 10 feet downstream/west of Route 7 bridge, Williamstown.														
11-0010	11-0011	7/8/97	11:30	117	126	--	23	5.2	--	**	--	0.12	0.54	0.05
11-0011	11-0010	7/8/97	11:30	117	125	--	23	7.0	--	**	--	0.13	0.55	0.03

** = missing/censored data -- = no data

Table B4. 1997 DEP DWM Hudson River Basin, Hoosic River Subbasin Survey, instream physico/chemical data. All units in mg/L unless otherwise noted. (Continued)

		Time (24h)	Alkalinity	Hardness	Specific Conductivity (umhos)	Chloride	Suspended Solids	Total Solids	Turbidity (NTU)	Total Kjeldahl Nitrogen	Ammonia	Nitrate	Total Phosphorus
Pipe/Discharge to HOOSIC RIVER													
Station: MA0100510, Mile Point: 1.5													
Description: Hoosac WPCF discharge approximately 2000 feet downstream/west of Route 7 bridge, Williamstown.													
11-0013		7/8/97	11:50	111	120	--	43	--	--	**	--	--	--	--
11-0026		8/12/97	11:30	121	122	--	39	--	--	0.80	--	--	--	--
11-0039		9/16/97	**	157	130	--	43	--	--	1.4	--	--	--	--
HOOSIC RIVER													
Station: HR02, Mile Point: 0.3													
Description: west off Route 7 onto dirt road, cross railroad tracks to sample upstream of small unnamed tributary, Williamstown.													
11-0012		7/8/97	12:20	113	120	--	23	6.0	--	**	--	0.06	0.68	0.03
11-0024		8/12/97	12:04	121	133	--	28	3.4	--	0.80	--	0.06	0.35	0.02
11-0037	11-0038	9/16/97	11:25	126	141	--	25	4.4	--	1.1	--	0.37	0.44	0.07
11-0038	11-0037	9/16/97	11:38	126	142	--	25	4.4	--	1.1	--	0.37	0.44	0.07
GREEN RIVER													
Station: GN01, Mile Point: 0.6													
Description: approximately 20 feet upstream/southwest of Route 2 bridge, Williamstown.													
11-0008		7/8/97	10:50	89	88	--	8.0	<2.5	--	**	--	<0.02	0.33	0.01
11-0021	11-0022	8/12/97	10:20	102	103	--	9.0	<2.5	--	0.90	--	<0.02	0.35	0.01
11-0022	11-0021	8/12/97	10:20	102	104	--	9.0	<2.5	--	0.80	--	<0.02	0.33	0.01
11-0034		9/16/97	10:30	103	110	--	10	<2.5	--	0.80	--	<0.02	0.21	0.01

** = missing/censored data -- = no data

Table B4. 1997 DEP DWM Hudson River Basin, Hoosic River Subbasin Survey, instream physico/chemical data. All units in mg/L unless otherwise noted. (Continued)

		Time (24h)	Alkalinity	Hardness	Specific Conductivity (umhos)	Chloride	Suspended Solids	Total Solids	Turbidity (NTU)	Total Kjeldahl Nitrogen	Ammonia	Nitrate	Total Phosphorus
NORTH BRANCH HOOSIC RIVER													
Station: HR09A, Mile Point: 2													
Description: approximately 20 feet upstream/north of Hudson Brook confluence with North Branch Hoosic River, North Adams.													
11-0006	7/8/97	13:12	46	105	--	15	10	--	**	--	0.02	0.15	0.06
11-0019	8/12/97	**	52	54	--	15	13	--	8.3	--	<0.02	<0.02	0.02
11-0032	9/16/97	11:42	44	46	--	14	8.2	--	9.3	--	<0.02	0.05	0.02

** = missing/censored data -- = no data

Table B5. 1997 DEP DWM Hudson River Basin, Hoosic River Subbasin Survey, bacteria data. Units in colonies/100 mls.

			TIME (24h)	FECAL	E-COLI	ENTEROCOCCUS	AEROMONAS
HOOSIC RIVER							
Station: HR08A, Mile Point: 22.1							
Description: downstream/east at Route 8 near outlet Cheshire Reservoir, Cheshire.							
11-0001		7/8/97	10:08	600	<20	--	--
11-0014	11-0015	8/12/97	9:49	**	--	--	--
11-0015	11-0014	8/12/97	9:49	**	--	--	--
11-0027		9/16/97	8:55	1,100	300	--	--
HOOSIC RIVER							
Station: HR07A, Mile Point: 14							
Description: approximately 50 feet upstream/south of Lime Street bridge, Adams.							
11-0003		7/8/97	11:00	1,400	180	--	--
11-0016		8/12/97	10:46	**	--	--	--
11-0028	11-0029	9/16/97	9:57	**	**	--	--
11-0029	11-0028	9/16/97	9:57	**	**	--	--
Pipe/Discharge to HOOSIC RIVER							
Station: MA0100315, Mile Point: 13.7							
Description: Adams WWTP outfall approximately 2000 feet downstream/north of Lime Street bridge, Adams.							
11-0007		7/8/97	12:25	--	--	--	--
11-0020		8/12/97	**	--	--	--	--
11-0033		9/16/97	11:15	--	--	--	--
HOOSIC RIVER							
Station: HR07, Mile Point: 11.5							
Description: upstream/south at Hodges Cross Road bridge, North Adams.							
11-0004	11-0005	7/8/97	11:50	1,000	320	--	--
11-0005	11-0004	7/8/97	11:50	1,200	240	--	--
11-0018		8/12/97	**	**	--	--	--
11-0030		9/16/97	10:41	760	140	--	--

** = missing/censored data -- = no data

Table B5. 1997 DEP DWM Hudson River Basin, Hoosic River Subbasin Survey, bacteria data. Units in colonies/100 mls. (Continued)

			TIME (24h)	FECAL	E-COLI	ENTEROCOCCUS	AEROMONAS
HOOSIC RIVER							
Station: HR03, Mile Point: 2							
Description: approximately 1000 feet upstream/east of Route 7 bridge, Williamstown.							
11-0023		8/12/97	11:06	**	--	--	--
11-0035		9/16/97	10:53	240	60	--	--
HOOSIC RIVER							
Station: HR03D, Mile Point: 1.9							
Description: approximately 10 feet downstream/west of Route 7 bridge, Williamstown.							
11-0010	11-0011	7/8/97	11:30	1,100	200	--	--
11-0011	11-0010	7/8/97	11:30	600	260	--	--
Pipe/Discharge to HOOSIC RIVER							
Station: MA0100510, Mile Point: 1.5							
Description: Hoosac WPCF discharge approximately 2000 feet downstream/west of Route 7 bridge, Williamstown.							
11-0013		7/8/97	11:50	--	--	--	--
11-0026		8/12/97	11:30	**	--	--	--
11-0039		9/16/97	**	--	--	--	--
HOOSIC RIVER							
Station: HR02, Mile Point: 0.3							
Description: west off Route 7 onto dirt road, cross railroad tracks to sample upstream of small unnamed tributary, Williamstown.							
11-0012		7/8/97	12:20	800	100	--	--
11-0024		8/12/97	12:04	**	--	--	--
11-0037	11-0038	9/16/97	11:25	200	<20	--	--
11-0038	11-0037	9/16/97	11:38	300	20	--	--

** = missing/censored data -- = no data

Table B5. 1997 DEP DWM Hudson River Basin, Hoosic River Subbasin Survey, bacteria data. Units in colonies/100 mls. (Continued)

			TIME (24h)	FECAL	E-COLI	ENTEROCOCCUS	AEROMONAS
GREEN RIVER							
Station: GN01, Mile Point: 0.6							
Description: approximately 20 feet upstream/southwest of Route 2 bridge. Williamstown.							
11-0008		7/8/97	10:50	940	200	--	--
11-0021	11-0022	8/12/97	10:20	**	--	--	--
11-0022	11-0021	8/12/97	10:20	**	--	--	--
11-0034		9/16/97	10:30	140	60	--	--
NORTH BRANCH HOOSIC RIVER							
Station: HR09A, Mile Point: 2							
Description: approximately 20 feet upstream/north of Hudson Brook confluence with North Branch Hoosic River, North Adams.							
11-0006		7/8/97	13:12	100	<20	--	--
11-0019		8/12/97	**	**	--	--	--
11-0032		9/16/97	11:42	60	<20	--	--

** = missing/censored data -- = no data

Macroinvertebrates

Results from DEP's 1997 benthic macroinvertebrate study are presented in Appendix C of this report (*Hudson River Basin 1997 Water Quality Assessment Report*).

Fish Population

Results from the 1997 fish population survey (MA DEP 1997b) are presented in Table B6.

Fish Toxics

Brown trout, brook trout, rainbow trout *Oncorhynchus mykiss*, longnose sucker *Catostomus catostomus*, and white sucker *Catostomus commersoni*, composites and individuals were analyzed for PCBs, organochlorine pesticides, and selected metals. These data (MA DEP 1997c) are provided in Table B7.

PCBs in brown trout and brook trout samples (n=4) from below SEC ranged from 1.1 to 1.4 mg/Kg. PCBs were below detection in brown trout, brook trout, rainbow trout and sucker samples (n=8) from the North Branch of the Hoosic River upstream of SEC. While it is likely that the brook trout and rainbow trout collected from the upstream locations were probably fish stocked by the Massachusetts Division of Fisheries and Wildlife and Environmental Law Enforcement (MDFWELE) during the spring of 1997, there is no record of the stocking of brown trout during 1997. The brown trout were either part of a self-sustaining population or stocked at an earlier date. The absence of PCBs in fish tissue samples from the North Branch Hoosic River seems to indicate that PCB contamination is not posing a threat to aquatic biota at the two locations sampled.

Table B6. 1997 DEP DWM Hudson River Basin Survey. Fish population data in the Hoosic River and Kinderhook Subbasins.

Stations	Species[1]						
	EBT	BT	LND	BND	SS	LNS	WS
Hoosic River Subbasin							
East Branch Green River approximately 0.1 mile upstream of confluence with Green River, New Ashford.	7(11)[2]	(16)	1	4	55		
Green River downstream of Mill on the Floss Restaurant, New Ashford.	3(14)	9(4)			29	1	
Green River off Greylock Road upstream of Route 7 crossing, New Ashford.	7(45)	7(26)		12	150 estimated		
Green River upstream of Blair Road, Williamstown.		15(3)	89	75(TNTC[3])	86		3(3)
Green River adjacent to/northwest of East Lawn Cemetery, Williamstown.		13(21)	175	91	2*	10	12
Bassett Brook upstream/northwest of Fred Mason Road, Cheshire.	10(15)						
Pecks Brook off West Mountain Road, Adams. (upstream of powerline crossing to base of gorge)	9(16)	1(17)		1			
Kinderhook Subbasin							
Kinderhook Creek downstream/south of Brodie Mountain Road, Hancock. (downstream/south of Bentley Brook confluence and 'Jiminy Peak water withdrawal')	4(2)	2(62)			103(TNTC)		
Kinderhook Creek downstream/south of Brodie Mountain Road, Hancock. (between Whitman Brook and Bentley Brook upstream/north of 'Jiminy Peak water withdrawal')	1(1)	4(39)			116(TNTC, TSTN[4])		

[1]Species Code | Common Name | Scientific Name

BND	blacknose dace	*Rhinichthys atratulus*
BT	brown trout	*Salmo trutta*
EBT	brook trout	*Salvelinus fontinalis*
LND	longnose dace	*Rhinichthys cataractae*
LNS	longnose sucker	*Catostomus catostomus*
SS	slimy sculpin	*Cottus cognatus*
WS	white sucker	*Catostomus commersoni*

[2] (number of young-of-the-year counted)
[3] (TNTC) too numerous to count
[4] (TSTN) too small to net
*pickup estimated at 30% observed

Table B7. 1997 DEP DWM Hudson River Basin, Hoosic River Subbasin Survey. Fish toxics monitoring data for the Hoosic River, North Adams and North Branch Hoosic River, Clarksburg and North Adams. Data expressed in mg/kg unless otherwise noted. All concentrations are in wet weight.

Analysis #	Sample ID	Collection Date	Species Code[1]	Sample Type[2]	Length (cm)	Weight (gm)	Cd	Pb	Hg	As	Se	% Lipids	PCB[3] (µg/g)	Pesticides[3] (µg/g)
Hoosic River														
Station F0052: upstream of Route 2 and railroad bridge, North Adams.														
97005	HRF97-20	08/11/97	BT	I	29.3	***	<0.020	<0.140	<0.020	<0.040	0.387	2.1	1.1* 0.27**	ND
97006	HRF97-21	08/11/97	BT	C	26.1	***	<0.020	<0.140	<0.020	<0.040	0.308	3.2	1.4*	ND
	HRF97-22	08/11/97	BT	C	23.5	***							0.24**	
	HRF97-23	08/11/97	BT	C	24.1	***								
97007	HRF97-24	08/11/97	BT	C	22.3	***	<0.020	<0.140	<0.020	<0.040	0.316	1.8	1.4*	ND
	HRF97-25	08/11/97	BT	C	23.4	***							0.26**	
	HRF97-26	08/11/97	BT	C	20.3	***								
97008	HRF97-27	08/11/97	EBT	C	21.6	***	<0.020	<0.140	<0.020	<0.040	0.419	2.5	4.1*	ND
	HRF97-28	08/11/97	EBT	C	17.6	***							1.4**	
North Branch Hoosic River														
Station F0051: upstream of Henderson Road, Clarksburg.														
97001	HRF97-01	08/11/97	WS	C	21.0	***	<0.020	<0.140	0.200	<0.040	0.241	0.36	ND	ND
	HRF97-02	08/11/97	WS	C	21.4	***								
	HRF97-03	08/11/97	WS	C	23.7	***								
97002	HRF97-04	08/11/97	RT	C	37.0	***	<0.020	<0.140	<0.020	0.259	0.250	0.73	ND	ND
	HRF97-05	08/11/97	RT	C	32.3	***								
97003	HRF97-06	08/11/97	EBT	C	28.5	***	<0.020	<0.140	<0.020	0.138	0.236	0.30	ND	ND
	HRF97-07	08/11/97	EBT	C	23.8	***								
97004	HRF97-08	08/11/97	BT	I	26.6	***	<0.020	<0.140	0.580	<0.040	0.320	0.44	ND	ND
Station F0050: upstream of Route 8, North Adams.														
97009	HRF97-30	08/26/97	WS	C	22.0	***	<0.020	<0.140	0.320	<0.040	0.184	0.30	ND	ND
	HRF97-31	08/26/97	LNS	C	21.0	***								
	HRF97-32	08/26/97	LNS	C	22.6	***								
97010	HRF97-33	08/26/97	BT	I	32.0	***	<0.020	<0.140	0.420	<0.040	0.302	0.90	ND	ND
97011	HRF97-34	08/26/97	BT	I	30.5	***	<0.020	<0.140	0.430	<0.040	0.294	0.44	ND	ND
97012	HRF97-35	08/26/97	RT	I	28.1	***	<0.020	<0.140	<0.020	<0.040	0.215	0.34	ND	ND

[1]Species
brown trout (BT) *Salmo trutta*
eastern brook trout (EBT) *Salvelinus fontinalis*
longnose sucker (LNS) *Catostomus catostomus*
rainbow trout (RT) *Oncorhynchus mykiss*
white sucker (WS) *Catostomus commersoni*

[2]Sample Type (All samples were fillets with skin off.)
Composite (C)
Individual (I)

ND - not detected

[3]Analyzed just beyond the EPA recommended holding time although extraction was within holding time.
* Arochlor 1242
** Arochlor 1254
*** not weighed

Lakes

Lake synoptic survey results (MA DEP 1997d) are presented in Table B8.

Table B8. 1997 DEP DWM Hudson River Basin, Hoosic River Subbasin lake survey data.

LAKE	SEGMENT NUMBER	SIZE (Acres)	TROPHIC STATE	OBSERVATIONS, Objectionable Conditions
Berkshire Pond, Lanesborough	MA11001	22	E	Non-native (Ms) Noxious plants
Cheshire Reservoir (North Basin), Cheshire/ Lanesborough	MA11002	218	H	Non-native plants (Ms) Noxious plants Turbidity
Cheshire Reservoir (Middle Basin), Cheshire/ Lanesborough	MA11018	132	H	Non-native plants (Ms) Noxious plants Turbidity
Cheshire Reservoir (South Basin), Cheshire/ Lanesborough	MA11019	67	E	Non-native plants (Ms, Pc) Noxious plants
Mt. Williams Reservoir, North Adams **	MA11010	43	U	None noted
Notch Reservoir, North Adams **	MA11011	25	U	None noted
Windsor Lake, North Adams	MA11016	17	U	None noted

** Indicates Class A (water supply) waterbody; all others are Class B.
Trophic State-- E= Eutrophic, H= Hypereutrophic, U= Undetermined.
Non-native Plants-- Ms= *Myriophyllum spicatum.* , Pc= *Potamogeton crispus.*

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APPENDIX C - DEP BIOMONITORING TECHNICAL MEMORANDUM

To: Hudson River Watershed Team; Tom O'Brien, EOEA; Bill Prendergast, DEP, Western Regional Office

From: Robert M. Nuzzo, DEP/DWM, Worcester

Date: 30 September 1999

HUDSON RIVER WATERSHED (KINDERHOOK CREEK AND HOOSIC RIVER SUBWATERSHEDS)
1997 BIOLOGICAL ASSESSMENTS

As part of the Division of Watershed Management's 1997 Hudson River watershed assessments, benthic macroinvertebrates were collected to gauge the biological health of the Hoosic River and Kinderhook Creek drainages. Based on priorities expressed by the Hudson watershed team, the monitoring effort in the Hoosic drainage was concentrated along the Green River but also included paired sites on the Hoosic River mainstem, as well as one site each on Peck's and Bassett Brooks. Two stations were sampled on Kinderhook Creek. The Green River is a major tributary to the Hoosic River, the two becoming confluent in Williamstown near Route 2 at Williams College. The Green River monitoring data were intended to provide an update on the status of water quality and to see if the analysis detected any evidence of impacts from nonpoint source pollution or the minor discharges listing this river as the receiving water. The Hoosic River monitoring sites were selected as upstream/downstream pairs, bracketing the Hoosac Valley Water Quality District wastewater treatment plant (WWTP) and the Adams Wastewater Treatment Plant. Bassett Brook (tributary to a public water supply) and Pecks Brook drain an area on the eastern flanks of Saddle Ball Mountain and Mount Greylock that is slated for development. These sites were intended to provide baseline data. The two monitoring sites on Kinderhook Creek bracketed a water withdrawal structure used by Jiminy Peak ski area. Sampling location descriptions and dates are given in Table 1 and station locations are shown on the watershed map in Figure 1.

Table 1. Sampling locations and sampling dates for Hudson River watershed benthic biomonitoring.

Station	Stream	Location	Date Sampled
GN04	Green River	downstream from Mill-on-the-Floss Restaurant, New Ashford, MA	11 August 1997
GE01	E. Br. Green River	upstream from Green River confluence, New Ashford, MA	11 August 1997
GW01	W. Br. Green River	upstream from Old Mill Road, Williamstown, MA	12 August 1997
GN03	Green River	upstream from lower Rte. 43, Williamstown, MA	12 August 1997
GN02	Green River	downstream from Blair Rd., Williamstown, MA	12 August 1997
GN01	Green River	upstream from Rte. 2, Williamstown, MA	12 August 1997
BB00	Bassett Brook	upstream from Mason Rd. and gas pipeline, Cheshire, MA	3 September 1997
PB00	Pecks Brook	upstream from West Rd. high-tension power lines, Adams, MA	3 September 1997
HR07U	Hoosic River	upstream from WWTP, Adams, MA	13 August 1997
HR07D	Hoosic River	downstream from WWTP, Adams, MA	13 August 1997
HR03	Hoosic River	upstream from Hoosac WQD WWTP Williamstown, MA	12 August 1997
HR02	Hoosic River	downstream from Hoosac WQD WWTP, Williamstown, MA	12 August 1997
KC01	Kinderhook Creek	downstream from Brodie Mountain Rd. & upstream from Bentley Brook, Hancock, MA	11 August 1997
KC02	Kinderhook Creek	downstream from Bentley Brook, Hancock, MA	11 August 1997

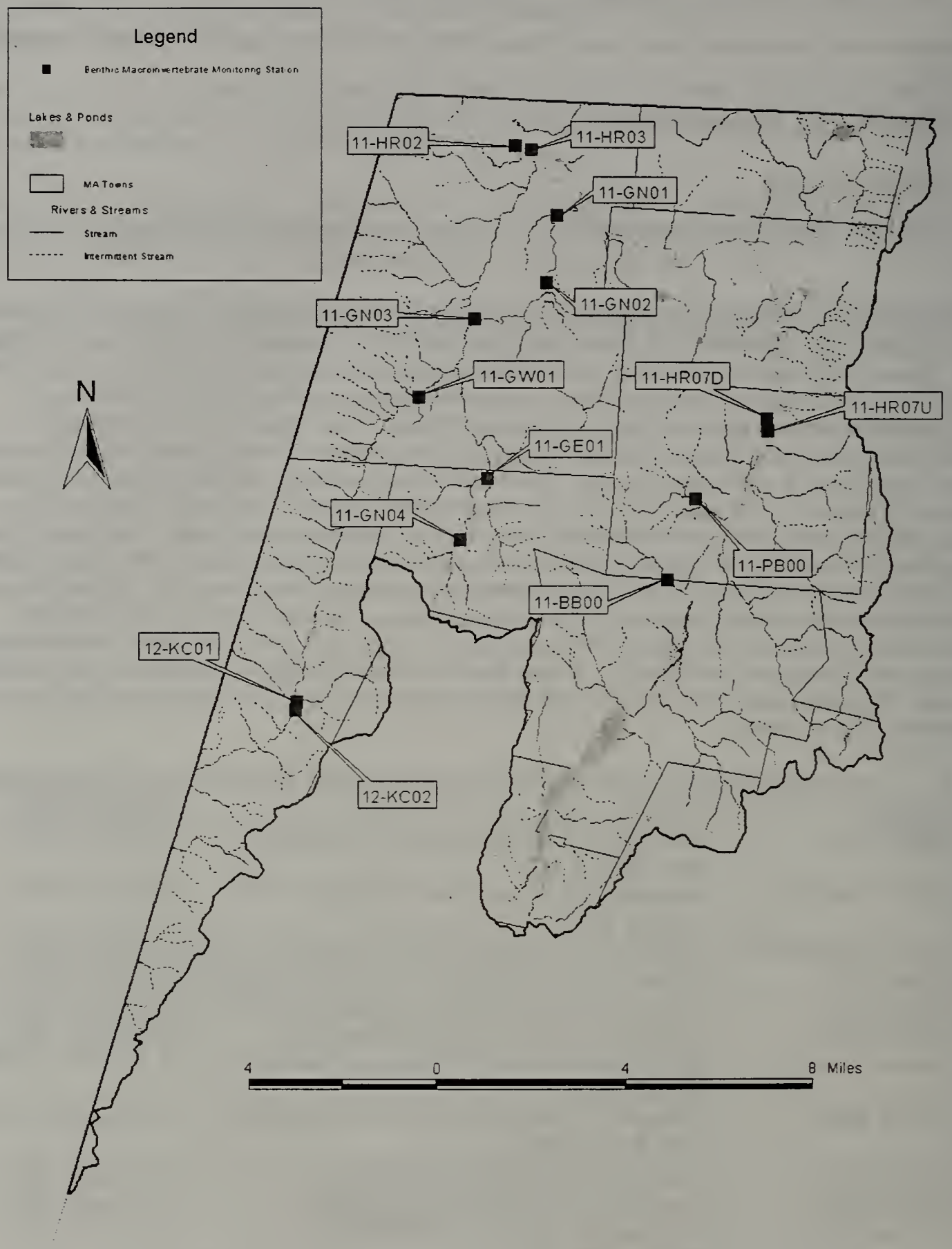

Figure 1. Location of benthic macroinvertebrate sampling stations within the Hoosic and Kinderhook drainages of the Hudson River watershed.

METHODS

Sampling and processing procedures are described in detail in the benthos monitoring SOP (Nuzzo 1999) but a brief description is given here. A 100 m reach of stream at each location was sampled by kicking bottom substrates in riffle habitats to dislodge resident invertebrates and capture them in a 500 µm mesh kick-net. Ten kicks in squares approximately 0.46 m x 0.46 m were composted for a total sample area of about 2 m^2. Samples were preserved in the field with denatured 95% ethanol, then brought to the DWM lab for processing. Before leaving the sample reach, habitat qualities were scored using a modification of the evaluation procedure in Plafkin, *et al.* (1989). A copy of the habitat evaluation form appears in Appendix A (Table A1).

Processing entailed distributing a sample in pans, randomly selecting grids within the pans, and sorting specimens from the other materials in the sample until approximately 100 organisms (±10%) were extracted. Specimens were identified to genus or species as allowed by available keys, specimen condition, and specimen maturity. Taxonomic data were analyzed using a modification of Rapid Bioassessment Protocol III (RBP III) metrics and scores (Plafkin, *et al.* 1989). The modifications were: substitution of percent similarity for the Community Loss Index, elimination of the shredder/total ratio (no separate leaf-pack material was collected), and addition of the NYSPMA (New York State Percent Model Affinity) score as a metric. The NYSPMA score is based on a sample assemblage's affinity to a model of a "healthy" benthic community (Novak and Bode 1992). Since this metric was developed for New York State's streams, and this watershed is common to New York and Massachusetts, it seemed both useful and appropriate to include it in the suite of metrics for the assessment.

RESULTS

HOOSIC/HUDSON WATERSHED

The Hoosic River begins at the outlet of Cheshire Reservoir in Cheshire, MA. It flows north-northeasterly through a valley carved out between the Hoosac Range to the east and the Mount Greylock Reservation to the west, passing through Adams and meeting the North Branch in downtown North Adams. From there it flows in a mostly westerly direction to the confluence with the Green River in Williamstown, then mostly northerly into Vermont. Bassett Brook, which flows off the southern end of Saddle Ball Mountain's eastern flank, enters the Hoosic at Cheshire Harbor, just south of Adams. Pecks Brook drains a portion of Mount Greylock's eastern flank and is intercepted by the Hoosic in the heart of downtown Adams.

The Green River is the Hoosic's largest tributary. Its west branch starts in the Taconic mountain range, at the eastern edge of Stephentown, NY, draining into Hancock, MA through Gardner Hollow, then flowing north-northeasterly through Hancock into Williamstown. The East Branch Green River flows north-northwesterly from the northern end of New Ashford, east of U.S. Rte. 7 and west of the Mount Greylock Reservation. The mainstem Green River begins in a wetland area east of U.S. Rte. 7 and south of Ingraham Road in New Ashford. It flows in a generally northerly direction, becoming confluent with the East Branch just before crossing into Williamstown. The mainstem meets the West Branch in south-central Williamstown, then flows in a generally northeasterly direction, until it crosses under Rte. 2 and flows into the Hoosic River in the vicinity of Williams College.

The list of taxa and counts at each of the sampling locations in the Hoosic drainage can be found in Appendix B, Tables B1 and B2.

GE01—EAST BRANCH GREEN RIVER, UPSTREAM FROM GREEN RIVER CONFLUENCE, NEW ASHFORD, MA

HABITAT

The East Branch Green River begins in New Ashford, MA at the confluence of several small tributaries coming from the western slopes of Jones Nose (at the southwestern end of Saddle Ball Mountain) and a notch between Sugarloaf and Rounds Rock. Most of the watershed is forested but the lower portion has three or four houses and mowed fields adjacent to the wooded riparian corridor. Greylock Road (presumed to be lightly traveled) crosses through the upper portion of this basin. Because the East

Branch has relatively little human activity taking place within its drainage GE01 was chosen to serve as the reference for all the Hudson Watershed biomonitoring sites.

Located approximately 200 m upstream from the confluence with the Green River, GE01 provided good substrates for benthic macroinvertebrates but was limited by low water. At higher volumes the sample reach would have provided excellent fast-flowing, coarse substrate habitat for the benthos, and good cover for fish. At the time of sampling, however, much of the substrate materials, and what could serve as fish cover, were exposed. This was likely the typical seasonal low flow condition for a stream of this type and drainage area (ca. 10.1 km^2; 3.9 mi^2). The riparian buffer zone was very good on the western edge of the stream, but there was only about six meters of wooded buffer between the eastern edge and a mowed field. The overall habitat score was 143/200 (Appendix A, Table A2).

BENTHOS

There were 32 distinct taxa counted in this sample (Table 2), the most abundant taxon accounting for 11% of the total. The high richness and even distribution of this assemblage coupled with the relatively low biotic index indicate a very healthy aquatic community. This is further supported by the NYSPMA score (74) indicating close agreement with the model. These data tend to support the conclusion that the waters of the East Branch are of high quality, and thus serve as a good reference.

Also captured in the net but not retained with the sample were slimy sculpins and crayfish. No algal mats or filaments were seen.

GN04—GREEN RIVER DOWNSTREAM FROM MILL-ON-THE-FLOSS RESTAURANT, NEW ASHFORD, MA

HABITAT

Just east of U.S. Route 7 in New Ashford, MA, a wetland on the south side of Ingraham Road drains under the road to a small stream flowing northward. From the USGS topographic maps it would appear that this is the beginning of the mainstem Green River. GN04 was about 800 m downstream from Ingraham Road. The upper end of the sample reach was at a pool at the base of a waterfall; the bottom of the reach was at the upper end of what had been an impoundment. In between were scattered, shallow riffles with substrates ranging from bedrock slabs to gravel. This reach ran through woods dominated by hemlocks, providing a riparian buffer zone of at least 18 m on both banks. This site had an upstream drainage area of 11.0 km^2 (4.3 mi^2) and like GE01 also had habitat limitations attributable to seasonal low flow. The overall habitat score was 160/200 (Appendix A, Table A2).

BENTHOS

Richness was high in this sample (30) but there was slight hyperdominance by the elmid beetle, *Optioservus* sp. The abundance of the *Optioservus* sp. larvae helped generate a very high scraper/filtering collector ratio. All of the other metrics performed poorly enough against the reference to result in point deductions, and ultimately in a score (24/48) that fell into the Slightly Impaired category (Table 2).

Table 2. RBP data summary for Green River biomonitoring sites sampled 11-12 August 1997.

STATION #	GN01		GN02		GN03		GN04		GW01		GE01	
STREAM	Green River upst. fr. Route 2, Williamstown		Green River dnst. fr. Blair Rd., Williamstown		Green River upst. fr. "lower" Route 43 Williamstown		Green River dnst. fr. Mill-on-the-Floss Rest., New Ashford		W. Br. Gr. R. upst. fr. Old Mill Rd., Williamstown		E. Br. Gr. R. upst. fr. confluence, New Ashford	
HABITAT SCORE	160;	>100%	169;	>100%	163;	>100%	160;	>100%	164;	>100%	143;	R
TAXA RICHNESS	30 94%	score: 6	32 100%	score: 6	35 >100%	score: 6	33 >100%	score: 6	27 84%	score: 6	32 R	score: 6
BIOTIC INDEX	4.67 76%	 4	4.92 72%	 4	4.84 73%	 4	3.86 92%	 6	4.64 77%	 4	3.55 R	 6
EPT INDEX	9 53%	 0	10 59%	 0	11 65%	 0	15 88%	 4	9 53%	 0	17 R	 6
EPT/CHIRONOMIDAE	0.69 6%	 0	0.47 4%	 0	0.82 7%	 0	1.6 15%	 0	0.94 9%	 0	11 R	 6
RIFFLE COMMUNITY: SCRAPERS/FILT. COLL.	2.0 >100%	 6	0.50 >100%	 6	0.53 >100%	 6	0.41 >1.5	 6	1.8 >100%	 6	0.27 R	 6
[FC/Total]	(0.21)		(0.35)		(0.33)		(0.19)		(0.18)		(0.16)	
% CONTRIBUTION (DOM. TAXON)	25%	4	11%	6	10%	6	10%	6	24%	4	11%	6
%SIMILARITY	12%	0	13%	0	14%	0	32%	2	16%	0	100%	6
NYSPMA	63	4	63	4	68	6	67	6	66	6	74	6
Reference	GE01		GE01		GE01		GE01		GE01		R	
Score	24/48	24	26/48	26	28/48	28	36/48	36	26/48	26	R	48
Category	50%	MI	54%	SL	58%	SL	75%	SL	54%	SL		R

R = reference
SL = slightly impaired
MI = moderately impaired

Also caught in the net were slimy sculpin and a young-of-year brook trout. Filamentous algae scraped from bedrock in some of the riffles were probably *Vauceria* sp.; there was also an abundant presence of the diatom *Melosira* sp.

GW01—WEST BRANCH GREEN RIVER, UPSTREAM FROM OLD MILL ROAD, WILLIAMSTOWN, MA

HABITAT

From GN04 it is approximately 2.8 km to the confluence with the East Branch Green River, and another 4.5 km to the confluence with the West Branch. The West Branch sampling station (GW01) was located approximately 1.9 km upstream from the confluence and about 100 m upstream from Old Mill Road in Williamstown. By this point the West Branch has accumulated a drainage area of 32.4 km^2 (12.5 mi^2), about three times that of the GE01 or GN04. The substrates at this site were dominated by cobble but some sand and fine organic deposits were noted. In spite of the low flow status (channel only about 50% covered) the sample reach included a good variety of substrates, flow velocities, depth, and even useful fish habitat/cover. The eastern bank in the reach was steep and moderately unstable, with areas of erosion along about 30% of its length. The overall habitat score was 164/200 (Appendix A, Table A2).

BENTHOS

There was good richness of macroinvertebrate taxa at this site but there was slight hyperdominance by the elmid larva *Optioservus* sp., a relatively high HBI, and a suspiciously low EPT index. As a result, the total score (26/48) was only 54% of GE01's, ranking GW01 as Slightly Impaired (Table 2).

Because of the mostly closed canopy there was very little algal coverage, but a clump of filaments were collected from cobble in a riffle. The algae in the sample were mostly diatoms. *Fragilaria* sp. and naviculoid diatoms were most abundant, with *Melosira* sp., and the green, *Microthamnion* sp. common. The diatom *Synedra* sp. was also present, but sparse.

GN03—GREEN RIVER UPSTREAM FROM LOWER ROUTE 43 CROSSING, WILLIAMSTOWN, MA

HABITAT

The West Branch and mainstem Green River come together east of the junction of Route 43 (Green River Road) and US Route 7, in a barn yard of a dairy farm where cows could be observed standing in the river. Most of the west bank downstream from the barnyard to the first Route 43 crossing has little or no riparian buffer: the adjacent land was mowed up to the river bank. As the river crosses Route 43 about 900 m of the river is segmented to the west of the road before crossing back to the east side of the road. In the upper part of this segment cows were seen grazing on the grassy banks, and appear to have complete access to the river. GN03 was in the lower part of the segment, about 1.8 km downstream from the West Branch and Green River confluence and about 100 m upstream from the lower (more downstream, northern) Route 43 crossing.

Within the sample reach itself the epifaunal substrates were very good and the variety of water depths and velocities were also very good. Though water did not fill the channel there was a lot of very good habitat for both fish and aquatic macroinvertebrates. The overall habitat score was 163/200 (Appendix A, Table A2).

BENTHOS

Richness of taxa at GN03 (35) was the highest of any of the sites sampled in the Hudson watershed. The HBI was inflated compared to the reference, however, and the EPT index and the EPT/Chironomidae ratios were lower. These resulted in an overall score (28/48) low enough to place this site in the Slightly Impaired category (Table 2).

GN02—GREEN RIVER DOWNSTREAM FROM BLAIR ROAD, WILLIAMSTOWN, MA

HABITAT

Approximately 3.6 km downstream from GN03, and 650 m downstream from Blair Road, was sampling reach GN02. The substrates were dominated by boulders and cobbles but ranged from bedrock to sand and silt/clay, including some deposits of very fine organic matter. Overall the substrates, water velocity,

and depth characteristics were judged to be excellent for macroinvertebrate colonization. These attributes along with the abundance of instream cover also made this reach excellent habitat for fishes. The only apparent habitat deficiencies in this reach were instability and narrow riparian vegetative zone width on the east bank. The habitat score for GN02 was 169/200 (Appendix A, Table A2).

BENTHOS

Taxa richness was very good at this site but the HBI was the highest of any of the Hudson watershed sites, giving the strongest indication of nutrient/organic loading problems. The lowered EPT index, EPT/Chironomidae abundance ratio, and NYSPMA score all indicate a decline in water quality. The final score for this site (26/48) was in the Slightly Impaired category (Table 2).

GN01—GREEN RIVER UPSTREAM FROM ROUTE 2, WILLIAMSTOWN, MA

HABITAT

The most downstream Green River sampling station was approximately 3.1 km downstream from GN02 and 1.3 km upstream from the confluence with the Hoosic River. As the Green River enters the downtown Williamstown area it flows through a series of sharp curves, wrapping around Green River Linear Park-Mount Pleasant and alongside Eastlawn Cemetery. The sample reach encompassed the last big bend, which spans the boundary of the park and cemetery. In spite of the fact that less than 75% of the channel was filled with water there was excellent availability of usable epifaunal substrate, as well as fish cover, and there were excellent combinations of water depths and velocities. The most serious habitat degradation was sediment deposition and this most certainly is due to inadequate stormwater management. A culvert that enters the river opposite the Williamstown Municipal Garage, and has a steady flow of water, is probably conducting a small unnamed brook underneath the Garage and Rte. 43. The sediment deposition becomes conspicuous just downstream from the culvert and is evident throughout the sample reach. The overall habitat score was 160/200 (Appendix A, Table A2).

BENTHOS

Taxonomic richness remained high at this station but several of the metrics (HBI, EPT index, EPT/Chironomidae abundance ratio, NYSPMA) showed evidence of continued degradation in water quality in the Green River. As at GW01, the elmid larva, *Optioservus* sp. was somewhat hyperdominant, adding to the indicators of stress on the aquatic communities. The overall score on these metrics (24/48) placed this site in the Moderately Impaired category (Table 2).

BB00—BASSETT BROOK UPSTREAM FROM MASON ROAD, CHESHIRE, MA

HABITAT

The Hoosic River begins at the outlet of Cheshire Reservoir in Cheshire, MA. It flows for approximately 7.1 km before meeting Bassett Brook at Harbor Road in Cheshire Harbor. BB00 was located on Bassett Brook about 730 m upstream from Harbor Road (about 150 m upstream from Mason Road). The drainage area upstream from the sample reach was smaller than that of the reference site: 7.5 km^2 (2.9 mi^2) compared to GE01's 10.1 km^2 (3.9 mi^2) The streambed substrates at BB00 were nearly all cobble and boulder. Though less than half the channel carried water there was an abundance of riffle habitat, a variety of water depths and velocities, and excellent cover for fish. The overall habitat score was 181/200 (Appendix A, Table A3).

BENTHOS

In spite of a reasonably good EPT, this metric and the ratio of EPT individuals to midges resulted in large point losses. Hyperdominance by the midge, *Polypedilum aviceps* also caused a loss of points for percent contribution. Ironically, *P. aviceps* is considered a clean water indicator, seldom occurring in large populations in waters with any kind of impairment. Based only on the outcome of the metric score (26/48) BB00 ranked as Slightly Impaired (Table 3).

Table 3. RBP data summary for Bassett Brook (BB00) and Pecks Brook (PB00) biomonitoring sites sampled on 3 September 1997.

STATION #	GE01	BB00	PB00
STREAM	E. Br. Gr. R. upst. fr. confluence, New Ashford	Bassett Brook upst. fr. Gas pipeline, Cheshire	Peck's Brook upst. fr. Power lines, Adams
HABITAT SCORE	143 R	181 >100%	154 >100%
TAXA RICHNESS	32 score: R 6	27 score: 0.84 6	23 score: 0.72 4
BIOTIC INDEX	3.55 R 6	3.81 0.93 6	3.47 >1 6
EPT INDEX	17 R 6	13 0.76 2	11 0.65 0
EPT/CHIRONOMIDAE	11 R 6	0.54 0.05 0	7.0 0.64 4
RIFFLE COMMUNITY: SCRAPERS/FILT. COLL.	0.27 R 6	0.31 >1 6	4.2 >1 6
[FC/Total]	(0.16)	(0.16)	(0.05)
% CONTRIBUTION (DOM. TAXON)	11% 6	33% 2	16% 6
%SIMILARITY	R 6	26% 0	38% 2
NYSPMA	74 6	52 4	84 6
Reference	R	GE01	GE01
Score	R 48	26/48 26	34/48 34
Category	R	54% SL	71% SL

R = reference SL = slightly impaired

PB00—PECKS BROOK UPSTREAM FROM WEST ROAD, ADAMS, MA

HABITAT

Approximately 3.5 km downstream from the confluence of Bassett Brook with the Hoosic River is where Pecks Brook enters. PB00 was about 1.5 km upstream from the mouth of Pecks Brook and nearly 275 m upstream from West Road. The sample reach was bounded on the downstream end by the right-of-way for the high tension power lines, and at the upstream end by the pool at the base of a steep waterfall. The upstream drainage area (5.4 km^2—2.1 mi^2) was only little more than half that of the reference site, GE01. PB00 offered excellent rocky substrates (mostly cobble and boulder) for macroinvertebrates and adequate, though not optimal, fish cover. Only about 50% of the stream channel was filled and water depth tended to be shallow throughout. Along at least half of the reach both banks appeared to be moderately unstable and subject to erosion during high water. The overall habitat score was 154/200 (Appendix A, Table A3).

BENTHOS

Low relative richness and low EPT accounted for most of the point losses in scoring the metrics for this station. The HBI (3.47) was the lowest among the Hudson watershed sites sampled, and PB00 had the highest affinity for the New York State model of any of these sites. Based on the total score of the metrics alone this site would be ranked as Slightly Impaired (Table 3).

HR07U AND HR07D—HOOSIC RIVER AT ADAMS WWTP, ADAMS, MA

HABITAT

From the confluence with Pecks Brook the Hoosic flows through Adams appoximately 3.5 km to the sample reach, HR07U, the upstream half of an upstream/downstream pair of sites bracketing the Adams WWTP. This was about 50 m upstream from the discharge, and adjacent to a small island. The majority of water flowed along the west side of the island. Fast current predominated and the water depth varied,

up to a meter deep in places. The channel along the eastern side of the island carried much less water, uniformly shallow but fast-flowing. The bottom substrates were mostly cobble, with lesser amounts of boulder and gravel. Stable fish cover was very limited. The undisturbed riparian vegetative zone provided no more than six meters of buffer from cultivated fields on either bank. The overall habitat score was 153/200 (Appendix A, Table A3).

The other half of the bracket, HR07D, was approximately 450 m downstream from the discharge. Most of this distance was an extremely straight channel, rip-rapped along the eastern bank. The HR07D sample reach itself appeared to have a normal, sinuous pattern, although the banks in this reach were rip-rapped at the bends. Epifaunal substrates were excellent, primarily cobble; fish cover was good, but not optimal. About 5 - 10% of the bottom appeared to be affected by sediment deposition and bar formation. The velocity and depth combinations in this stretch were very good and more than 75% of the channel was covered with water. Some erosion potential was detected along the west bank and the riparian zone buffer between the east bank and a cultivated field was no more than 6 m. The overall habitat score was 158/200 (Appendix A, Table A3).

BENTHOS

The total richness of taxa at these sites was not low enough to lose points, but the richness of EPT taxa was very low at both sites, even the upstream one. Both sites exhibited slight hyperdominance. Upstream the dominant was the elmid beetle *Optioservus* sp. while downstream it was a filter-feeding caddisfly in the *Hydropsyche morosa* group. Both the upstream and downstream sites scored (28/48 for HR07U and 26/48 for HR07D) in the Slightly Impaired category when compared to the watershed reference, GE01. When the downstream site, HR07D was compared against its upstream reference (HR07U) there was little difference in the individual metrics and the total score ranked HR07D as Nonimpaired (Table 4).

HR03 AND HR02—HOOSIC RIVER AT HOOSAC WATER QUALITY DISTRICT, WILLIAMSTOWN, MA

HABITAT

For approximately the next 8.3 km downstream from HR07D, the Hoosic continues its northward path into downtown North Adams where it meets the North Branch Hoosic River amid high-sided concrete channels. From there the river flows westward through North Adams before crossing into Williamstown and beginning a gentle northward arc into Vermont. About 7.4 km from the North Branch confluence the Hoosic receives the waters of the Green River, and after another 3.0 km reaches HR03. HR03 was the upstream half of a pair of sites bracketing the Hoosac Water Quality District (HWQD) discharge. Lying about 230 m upstream from the discharge, HR03 was wide, with excellent substrates for benthos and well developed riffles and runs. Most of the channel was covered with water and there was an excellent range of velocity/depth patterns. Cover for fish was also excellent. There were some problems with sediment deposition

Table 4. RBP data summary for Hoosic River biomonitoring sites sampled 11-13 August 1997.

STATION #	GE01	HR02	HR03	HR07D	HR07U	HR02	HR03	HR07D	HR07U
STREAM	E. Br. Gr. R. upst. fr. confluence, New Ashford	Hoosic River dnst. fr. HWQD, Williamstown	Hoosic River upst. fr. HWQD, Williamstown	Hoosic River dnst. fr. Adams WWTP	Hoosic River upst. fr. Adams WWTP	Hoosic River dnst. fr. HWQD, Williamstown	Hoosic River upst. fr. HWQD, Williamstown	Hoosic River dnst. fr. Adams WWTP	Hoosic River upst. fr. Adams WWTP
HABITAT SCORE	143; R	172; >100%	162; >100%	158; >100%	153; >100%	172; >100%	162; R	158; >100%	153; R
TAXA RICHNESS	32 score: R 6	28 score: 0.88 6	26 score: 0.81 6	28 score: 0.88 6	26 score: 0.81 6	28 score: >1 6	26 score: R 6	28 score: >1 6	26 score: R 6
BIOTIC INDEX	3.55 R 6	4.60 0.77 4	4.71 0.75 4	4.57 0.78 4	4.14 0.86 6	4.60 >1 6	4.71 R 6	4.57 0.91 6	4.14 R 6
EPT INDEX	17 R 6	9 0.53 0	11 0.65 0	5 0.29 0	7 0.41 0	9 0.82 4	11 R 6	5 0.71 2	7 R 6
EPT/CHIRONOMIDAE	11 R 6	1.68 0.15 0	1.64 0.15 0	2.41 0.22 0	2.71 0.25 2	1.68 >1 6	1.64 R 6	2.41 0.89 6	2.71 R 6
SCRAPERS/FILT. COLL.	0.27 R 6	0.77 >1 6	1.5 >1 6	1.0 >1 6	1.8 >1 6	0.77 0.51 6	1.5 R 6	1.0 0.56 6	1.8 R 6
[FILT. COLL./TOTAL]	(0.16)	(0.38)	(0.19)	(0.31)	(0.21)	(0.38)	(0.19)	(0.31)	(0.21)
% CONTRIBUTION (DOM. TAXON)	11% 6	24% 4	19% 6	27% 4	20% 4	24% 4	19% 6	27% 4	20% 4
% SIMILARITY	R 6	10% 0	15% 0	7% 0	9% 0	57% 4	R 6	52% 4	R 6
[NYSPMA]	74 6	58 4	68 6	75 6	64 4	58 4	68 6	75 6	64 4
Reference	Reference	GE01	GE01	GE01	GE01	HR03	Reference	HR07U	Reference
Score	R 48	24/48 24	28/48 28	26/48 26	28/48 28	40/48 40	R 48	40/44 40	R 44
Category	Reference	50% MI	58% SL	54% SL	58% SL	83% NI	Reference	91% NI	Reference

NI = nonimpaired
SL = slightly impaired
MI = moderately impaired

and embeddedness of the benthic substrates. The northerly bank had erosion evident along about 30% of the length of the reach, indicating a high susceptibility during flood events. The vegetative buffer zone between the river and the roadway along the northerly bank was no more than 12 m. The overall habitat score was 162/200 (Appendix A, Table A3).

HR02 was approximately 550 m downstream from the HWQD discharge. This reach also had excellent benthic substrates and fish cover, with lesser evidence of sedimentation and embeddedness problems. More of the streambed substrates were exposed here, though, than at HR03 and the flow pattern tended to be more monotonous (one long riffle/run). Riparian zone vegetative cover and buffer distances were excellent. The overall habitat score was 172/200 (Appendix A, Table A3).

BENTHOS

Relative to GE01, the HBI was higher at both the upstream (HR03) and downstream (HR02) sites. These sites also had much lower EPT values resulting in scores of zero for that metric. HR02 had slight hyperdominance by the filter-feeding caddisfly, *Hydropsyche morosa* group. This site also had a reduced score for the NYSPMA. When compared against GE01, the total score for HR03 was 28/48 and the score for HR02 was 24/48 resulting in determinations of Slightly Impaired and Moderately Impaired, respectively. Using HR03 as the upstream reference, however, gave HR02 a total score of 40/48, placing it in the Nonimpaired category (Table 4).

KINDERHOOK/HUDSON

Kinderhook Creek originates in a fairly steep-sided valley in Hancock, Massachusetts between the Brodie Mountain ridge to the east and the Taconic Range ridge running along the New York State line between Rounds Mountain and Misery Mountain. This drainage abuts that of the West Branch Green River to the north. The Kinderhook flows southward, then southwesterly, covering approximately nine kilometers (5.6 mi.) before crossing the state line into New York.

The list of taxa and counts at the sampling locations in the Kinderhook Creek drainage can be found in Appendix B, Table B3.

KC01 AND KC02—UPSTREAM AND DOWNSTREAM FROM BENTLEY BROOK CONFLUENCE, HANCOCK, MA

HABITAT

Stations KC01 and KC02 were upstream and downstream (respectively) of the Bentley Brook confluence and the intake structure for Jiminy Peak's water withdrawal. The bottom of the KC01 sample reach was approximately 180 m downstream from Brodie Mountain Road and about 45 m upstream from Bentley Brook. KC02 was approximately 460 m downstream from Brodie Mountain Road, about 240 m downstream from Bentley Brook. The drainage area upstream from KC01 was 18 km^2 (6.8 mi^2) whereas the total upstream drainage area for KC02 was 25 km^2 (9.7 mi^2).

Cobble and boulder were the dominant substrate materials at KC01. Low water was very limiting at this site. The mostly shallow water filled no more than 25% of the channel and left little useful habitat with instream cover for fish. The riparian vegetative buffer was about 15 m to a mowed residential lawn on the east bank and 18 m or more on the west bank. The overall habitat score was 147/200 (Appendix A, Table A4).

The benthic substrate character at KC02 was very similar to that at KC01. Here, however, water filled more of the channel and provided some deeper water areas, resulting in more available habitat for both macroinvertebrates and fish. The western bank was a bit unstable in places but had a deep vegetated buffer zone; the eastern bank appeared to be quite stable but with a vegetated buffer zone of somewhat less than 18 m. The overall habitat score was 167/200 (Appendix A, Table A4).

BENTHOS

Though the richness of macroinvertebrates appeared to be very good at both KC01 and KC02, in both cases it was less than 80% of the watershed reference (GE01). Somewhat surprising was the relatively high HBI and the low EPT, given the position of these sites within the watershed. Hyperdominance also led to point losses at both sites. The total score relative to GE01 was 14/48 for KC01 and 18/48 for KC02, placing both sites in the Moderately Impaired category (Table 5).

Table 5. RBP data summary for Kinderhook Creek biomonitoring sites sampled 11 August 1997.

STATION #	GE01		KC01		KC02		KC01		KC02	
Stream	E. Br. Gr. R. upst. fr. confluence, New Ashford		Kinderhook Creek upst. fr. Bentley Brook, Hancock		Kinderhook Creek dnst. fr. Bentley Brook, Hancock		Kinderhook Creek upst. fr. Bentley Brook, Hancock		Kinderhook Creek dnst. fr. Bentley Brook, Hancock	
Habitat Score	143	R	147	>100%	167	>100%	147	>100%	167	>100%
Taxa Richness	32	score:	25	score:	23	score:	25	score:	23	score:
	R	6	0.78	4	0.72	4	R	6	0.92	6
Biotic Index	3.55		4.68		4.31		4.68		4.31	
	R	6	0.76	4	0.82	4	R	6	>1	6
Ept Index	17		9		9		9		9	
	R	6	0.53	0	0.53	0	R	6	1.0	6
Ept/Chironomidae	11		0.80		2.68		0.80		2.68	
	R	6	0.07	0	0.24	0	R	6	>1	6
Riffle Community: Scrapers/Filt. Coll.	0.27		0.04		0		0.04		0	
	R	6	0.15	0		0	R	6		0
[Fc/Total]	(0.16)		(0.23)		(0.33)		(0.23)		(0.33)	
% Contribution (Dom. Taxon)	11%	6	31%	2	20%	4	31%	2	20%	4
%Similarity	R	6	21%	0	24%	0	R	6	53%	4
Nyspma	74	6	64	4	79	6	64	4	79	6
Reference	R		GE01		GE01		R		KC01	
Score	R	48	14/48	14	18/48	18	R	42	34/42	38
Category	R		29%	MI	38%	MI	R		81%	NI

R = reference NI = nonimpaired MI = moderately impaired

When the metrics were recalculated using KC01 as the upstream reference site, the downstream site, KC02, lost points for its lack of scrapers, slight hyperdominance, and for only mediocre similarity to the assemblage at KC01. Even so, against this reference KC02 scored 38/42 for a rating of Nonimpaired (Table 5).

DISCUSSION AND CONCLUSIONS

Overall the benthic data suggest healthy, robust communities that in most cases would receive high scores in other watersheds around Massachusetts, particularly in the eastern half of the state. When compared to the extraordinary community attributes of the reference site (GE01—East Branch Green River), however, the scores indicate some degree of impairment at nearly every site assessed. In all cases it appears that the cause of the "impairment" is related to nonpoint source (NPS) pollution. While the results do not represent cause for alarm they nevertheless serve as indicators of developing problems and/or identify areas that could benefit from application of best management practices (BMPs) to control NPS pollution.

THE GREEN RIVER

All of the Green River sites offered excellent aquatic habitat. Interestingly, the reference station (GE01) earned the lowest overall score for habitat quality. The total richness of taxa was very good at all sites, each with 30 or more taxa represented, except GW04, which had 27. The EPT index also appeared good at all stations, but when compared to the reference only GN04 had a sufficient number of EPT taxa to score any points. The EPT/Chironomidae abundance ratio was so high (chironomid abundances were extremely low) at GE01 that none of the other Green River sites scored any points for that metric. Primarily because of these two EPT-related metrics, all of the Green River sites scored either in the

slightly impaired or moderately impaired category of the assessment. In another watershed the metric values that resulted in a determination of slightly impaired for these Green River sites probably would have resulted in a determination of nonimpaired.

With no major NPDES-permitted direct discharges—and only one NPDES cooling water discharge—to any of the Green River branches, any detected impairment must be from NPS contamination. A look at surrounding land use can offer clues as to the nature of the source. The only readily apparent influences acting on GN04 were runoff from Rte. 7 and the restaurant/motel property, and possible interaction of septic systems from the few upstream houses and the restaurant/motel property. For GN03, GN02, and GW01, agricultural practices are the likely cause of the detected impairment. Though the level of impairment is slight at these locations the elevated HBI values suggest that oxygen demand pressures (probably from nutrient loadings) may be stressing populations and that if not mitigated might be expected to intensify. The moderately impaired determination for GN01 is surely the result of the cumulative effects from upstream loadings plus ineffective stormwater management in the vicinity of the Williamstown Municipal Garage. If BMPs were implemented in the upstream reaches, and a stormwater mitigation plan were implemented at the Municipal Garage the assessment at this site should improve in the future.

THE HOOSIC RIVER

The Hoosic River receives wastewater from two major dischargers: the North Adams Wastewater Treatment Plant and the Hoosac Valley Water Quality District WWTP. Each discharge was bracketed by an upstream/downstream pair of stations. All four stations offered excellent substrate and flow conditions for the benthos. The score for HR02, downstream from the HWQD, put it in the Moderately Impaired category, while the other three stations scored in the Slightly Impaired category relative to the watershed reference—GE01. When compared against its respective upstream reference, however, each of the downstream stations (HR02 and HR07D) had scores that placed them in the Nonimpaired category. It would appear, then, that these discharges place little additional stress on aquatic life in this system; but the system could clearly benefit from an examination and evaluation of urban runoff and other potential NPS pollution sources.

PECKS BROOK AND BASSETT BROOK

The benthic habitat in Pecks Brook had excellent substrate characteristics and well developed riffles, though the water was shallow throughout and filled only about half of the channel. Bassett Brook had superb habitat for benthos, though it too had roughly half of its channel substrates exposed. Since both watersheds have very little development within them it is somewhat of a surprise to see their scores place them in the Slightly Impaired category. Though there was some evidence that there may have been recent logging activities in the vicinity of Bassett Brook, there really didn't seem to be any reason these watersheds would not be gauged unimpaired. These are very small watersheds, however; the area of the Pecks Brook watershed above the sample location is only 74% of the GE01 upstream watershed area, and Bassett Brook's is only 53%. It may be that these watersheds are simply too small to have developed the nutrient and energy flow necessary to support the kind of robust community found at GE01. Whatever the reason for these results they underscore the importance of establishing baseline data for these watersheds before any further development takes place. Since DWM's next scheduled monitoring isn't until 2002 it would be desirable for other parties—perhaps the watershed association, perhaps the developer of the proposed resort—to conduct aquatic life assessments in these watersheds.

KINDERHOOK CREEK

Both Kinderhook Creek sites provided very good substrates and well developed riffle habitat, though the site upstream from Bentley Brook (KC01) suffered from the low volume of water present (restricting the depth and availability of riffle habitat). Against the watershed reference (GE01) both Kinderhook Creek sites were rated moderately impaired. As compared to KC01, the site downstream from Bentley Brook (KC02) was Nonimpaired. Clearly, then, the impairment is occurring upstream from the Bentley Brook confluence. Dilution from Bentley Brook may be mitigating effects somewhat, judging from the improved HBI, NYSPMA score, and percent dominance. The only apparent sources of pollution in the upstream watershed are agricultural and road runoff.

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APPENDIX A Habitat Assessments

Table A1. Massachusetts DEP/DWM Habitat Assessment Field Scoring Sheet (page 1 of 2).
Investigator(s) _____ Reference Site _____

River Basin _____ Stream Name _____ Saris # _____

Describe Site Location: _____

Protocols for Wadable Riffle/Run Prevalent Streams: those in moderate to high-gradient landscapes that sustain water velocities of approximately 30 cm/sec or greater. Natural streams have substrates primarily composed of coarse sediment particles (i.e., gravel or larger) or frequent coarse particulate aggregations along stream reaches.

Habitat Parameter	CATEGORY			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Instream Cover (Fish)	A mix of snags, submerged logs, undercut banks, rubble, or other stable habitat in greater than 50% of the sample area	30-50% of area with a mix of stable habitat; adequate habitat for maintenance of populations	10-30% of area with a mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% of area with a mix of stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE ____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Epifaunal Substrate (in sampled area only)	Well-developed riffle and run; riffle is as wide as stream and length extends two times the width of stream; abundance of cobble. (Boulders prevalent in headwater streams).	Riffle is as wide as stream but length is less than two times width; abundance of cobble; boulders and gravel common.	Run area may be lacking; riffle not as wide as stream and its length is less than 2 times the stream width; gravel or bedrock prevalent; some cobble present.	Riffles or runs virtually nonexistent; bedrock prevalent; cobble lacking.
SCORE ____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2. 1 0
3. Embeddedness (riffles/runs)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE ____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 y) may be present, but recent channelization is not present.	New embankments present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted.
SCORE ____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE ____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Date: Station:

Table A1. Massachusetts DEP/DWM Habitat Assessment Field Scoring Sheet (page 2 of 2)

HABITAT PARAMETER	CATEGORY																	
	Optimal					Suboptimal					Marginal					Poor					
6. Velocity-Depth Combinations slow deep fast deep slow shallow fast shallow **(frequency of riffles or bends)**	**All 4 velocity/depth patterns present.** Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstructions is important.					**Only 3 of 4 velocity/depth patterns present** (i.e., slow [<0.3 m/s]-deep [>0.5 m]; slow-shallow; fast-deep; fast-shallow). Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.					**Only 2 velocity/depth patterns present**; usually lacking deep areas. Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.					**Dominated by one velocity/depth pattern.** Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.					
SCORE ———	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
7. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.					Water fills >75% of the available channel; or <25% of channel substrate is exposed.					Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.					Very little water in channel and mostly present as standing pools.					
SCORE ———	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
8. Bank Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces covered by naturally occurring vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; **almost all plants allowed to grow naturally**.					70-90% of the streambank surfaces covered by naturally occurring vegetation, but one class of plants is not well-represented; **disruption evident but not affecting full plant growth** potential to any great extent; more than one-half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; **disruption obvious**; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; **disruption of streambank vegetation is very high**; vegetation has been removed to 5 centimeters or less in average stubble height.					
SCORE (LB) ———	Left Bank	10	9	8	7	6	5	4	3	2	1	0									
SCORE (RB) ———	Right Bank	10	9	8	7	6	5	4	3	2	1	0									
9. Bank Stability (score each bank)	Banks stable; evidence of erosion or **bank failure absent or minimal**; little potential for future problems. <5% of bank affected.					Moderately stable; **infrequent, small areas of erosion mostly healed over**. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; **high erosion potential during floods**.					Unstable; many eroded areas; **"raw" areas frequent along straight sections and bends**; obvious bank sloughing; 60-100% of bank has erosional scars.					
SCORE (LB) ———	Left Bank	10	9	8	7	6	5	4	3	2	1	0									
SCORE (RB) ———	Right Bank	10	9	8	7	6	5	4	3	2	1	0									
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of **riparian zone >18 meters**; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.					Width of **riparian zone 12-18 meters**; human activities have impacted zone only minimally.					Width of **riparian zone 6-12 meters**; human activities have impacted zone a great deal.					Width of **riparian zone <6 meters**: little or no riparian vegetation due to human activities.					
SCORE (LB) ———	Left Bank	10	9	8	7	6	5	4	3	2	1	0									
SCORE (RB) ———	Right Bank	10	9	8	7	6	5	4	3	2	1	0									

TOTAL SCORE ———

Comments:

Date: Station:

Table A2. Habitat scores for Green River Stations and the reference station, GE01.

Habitat Category	GE01	GW01	GN04	GN03	GN02	GN01
Fish cover	8	19	15	17	20	20
Epifaunal Substrates	15	19	10	16	20	19
Embeddedness	19	16	19	13	13	13
Channel Alteration	20	20	19	19	20	20
Sediment Deposition	14	11	18	16	10	10
Velocity-Depth Combinations	8	17	13	16	19	19
Channel Flow Status	7	8	7	14	15	9
Bank Vegetative Protection	20	20	20	19	20	18
Bank Stability	19	16	20	17	18	15
Riparian Vegetated Zone Width	13	18	19	16	14	17
Total Points (out of 200 possible)	143	164	160	163	169	160

Table A3. Habitat scores for Bassett Brook, Pecks Brook, Hoosic River mainstem sites and the reference station, GE01.

Habitat Category	GE01	BB00	PB00	HR07U	HR07D	HR03	HR02
Fish cover	8	19	15	9	15	20	18
Epifaunal Substrates	15	20	20	20	20	20	20
Embeddedness	19	20	16	17	17	11	13
Channel Alteration	20	20	20	15	13	18	20
Sediment Deposition	14	20	18	19	14	10	17
Velocity-Depth Combinations	8	17	10	13	16	20	14
Channel Flow Status	7	7	8	18	15	16	11
Bank Vegetative Protection	20	20	20	20	19	18	20
Bank Stability	19	18	8	18	16	15	19
Riparian Vegetated Zone Width	13	20	19	4	13	14	20
Total Points (out of 200 possible)	143	181	154	153	158	162	172

Table A4. Habitat scores for Kinderhook Creek Stations KC01 and KC02 and the reference station, GE01.

Habitat Category	GE01	KC01	KC02
Fish cover	8	6	13
Epifaunal Substrates	15	16	19
Embeddedness	19	19	17
Channel Alteration	20	20	19
Sediment Deposition	14	18	18
Velocity-Depth Combinations	8	8	15
Channel Flow Status	7	6	11
Bank Vegetative Protection	20	20	20
Bank Stability	19	18	17
Riparian Vegetated Zone Width	13	16	18
Total Points (out of 200 possible)	143	147	167

APPENDIX B - Taxa Lists for 1997 Hudson River Watershed Benthic Macroinvertebrate Sampling Stations.

Table B1. These results are from the 1997 benthos sampling in the Green River (Hoosic/Hudson watershed). There were four stations on the mainstem Green River: GN01, upstream from Route 2 in Williamstown; GN02, downstream from Blair Road, Williamstown; GN03, upstream from the lower (more downstream) Route 43 crossing (B.M. 252.5 m), Williamstown; GN04, downstream from the falls at *Mill on the Floss* restaurant (east/southeast of New Ashford Cemetery), New Ashford. There was also one site each on the West Branch Green River (GW01, upstream from Old Mill Road, Williamstown) and the East Branch Green River (GE01, about 200 m upstream from its confluence with the mainstem Green River, New Ashford). GE01 was selected to serve as a watershed reference due to its relatively undisturbed drainage area. All sites were in Massachusetts. The columns labeled FFG and TOLVAL show the functional group and tolerance value, respectively, designated for each taxon, as used in the analyses.

TAXON/**METRIC**	FFG	TOLVAL	GN01	GN02	GN03	GN04	GW01	GE01
Physidae	GC	8		1				
Tubificidae immature with capilliform chaetae	GC	10					3	
Nais alpina	GC	8						1
Nais behningi	GC	6	2		2			
Nais bretscheri	GC	6			1			
Nais communis	GC	8						1
Lumbriculus sp.	GC	5	1	6	4	2	1	
Eclipidrilus sp.	GC	5				1		
Hydracarina	PR	6	2	1	10	2	1	2
Baetidae	GC	6	2	1		1	2	4
Baetidae undet. 1 (cerci only)	GC	6	1	2	1		2	4
Baetidae undet. 2 (short term.)	GC	6		1		2		
Baetidae undet. 3 (subeq. term.)	GC	6	1	1	3	6	4	
Acentrella sp.	GC	4		5				
Baetis sp. 2 (short term.)	GC	6						9
Baetis sp. 3 (subeq. term.)	GC	6						11
Isonychia sp.	GC	2			1		1	
Heptageniidae	SC	3	6					
Epeorus (Iron) sp.	SC	0				1		3
Stenonema sp.	SC	3		6	4		2	
Ephemerellidae	GC	2				2		
Drunella cornutella	GC	0						7
Ephemerella catawba	GC	1			1			
Serratella sp.	GC	2	1	1			4	
Tricorythodes sp.	GC	4			2			
Caenis sp.	GC	6	1					
Leptophlebiidae	GC	4						2
Pteronarcys sp.	SH	0						3
Tallaperla sp.	SH	0						2
Nemouridae	SH	2						2
Leuctra sp.	SH	0				2	1	3
Agnetina sp.	PR	2				9	6	
Perlodidae	PR	2			1			
Diura sp.	PR	2				3		1

TAXON/**METRIC**	FFG	TOLVAL	GN01	GN02	GN03	GN04	GW01	GE01
Sweltsa sp.	PR	0	1			9		7
Sialis sp.	PR	4						1
Dolophilodes sp.	FC	0		1				3
Psychomyia sp.	GC	2	1					
Polycentropodidae	FC	6						1
Polycentropus sp.	PR	6				1		
Cheumatopsyche sp.	FC	5		3	6	1		3
Hydropsyche sp.	FC	4			4	1	5	
Hydropsyche dicantha?	FC	2				1		
Hydropsyche morosa gr.	FC	6	7	2	5	1	1	1
Rhyacophila sp.	PR	1	1			4		
Agapetus sp.	SC	0				1		
Leucotrichia sp.	SC	6			1			
Brachycentrus sp.	FC	1				1		
Lepidostoma sp.	SH	1						1
Limnephilidae	SH	4		1				
Neophylax sp.	SC	3					1	
Helicopsyche borealis	SC	3		3	2			
Ectopria sp.	SC	5						1
Psephenus herricki	SC	4	1		1			
Optioservus sp.	SC	4	24	9	10	1	23	
Optioservus ampliatus(A)	SC	4				1	3	
Optioservus fastiditus (A)	SC	4	1					
Optioservus trivittatus (A)	SC	4	2					
Oulimnius latiusculus	SC	2				1	1	
Promoresia sp.	SC	2				2		
Stenelmis sp.	SC	5	5					
Antocha sp.	GC	3	2		5	1		
Dicranota sp.	PR	3					1	2
Hexatoma sp.	PR	2				2		1
Bezzia/Palpomyia sp.	PR	6				1		2
Simulium tuberosum complex	FC	4				1		6
Chironomidae	GC	6		1				
Tanypodinae	PR	7					1	
Conchapelopia sp.	PR	6	6	3	1	1		
Helopelopia sp.	PR	6			1			
Nilotanypus sp.	PR	6		2				
Trissopelopia sp.	PR	4					1	
Pagastia sp.	GC	1	1	1				
Potthastia gaedii gr.	GC	2			1			
Cardiocladius sp.	PR	5		2	3			
Corynoneura sp.	GC	4		1				
Cricotopus/Orthocladius sp.	GC	7		1	2			
Cricotopus bicinctus	GC	7			1			
Cricotopus vierriensis	SH	7	1					
Eukiefferiella sp.	GC	6				2	1	
Eukiefferiella pseudomontana gr.	GC	8			1			

TAXON/**METRIC**	FFG	TOLVAL	GN01	GN02	GN03	GN04	GW01	GE01
Helleniella sp.	GC	5					1	
Orthocladius sp.	GC	6	2					
Parametriocnemus sp.	GC	5	1			3	1	3
Synorthocladius sp.	GC	6		1				
Tvetenia vitracies gr.	GC	5	1	1				
Microtendipes sp.	FC	5		2				
Microtendipes pedellus gr.	FC	5		3	2			
Polypedilum aviceps	SH	4	3	5	4		4	1
Polypedilum convictum	SH	6		7	3		1	
Tribelos/Phaenopsectra sp.	GC	7	1					
Tanytarsini	FC	6				1		
Cladotanytarsus sp.	FC	5		1	1			
Micropsectra/Tanytarsus sp.	FC	7	4	3	3	3	6	
Micropsectra sp.	GC	7	1			7	6	
Micropsectra dives gr.	GC	7		2		3		
Rheotanytarsus distinctissimus gr.	FC	5		1	1	5	2	
Rheotanytarsus exiguus gr.	FC	6	2	2	1			
Sublettea coffmani	FC	4	7	7	7		1	
Tanytarsus sp.	FC	6		11	4	2	2	
Zavrelia/Stempellinella sp.	GC	4	2	1	2	1	4	2
Dixa sp.	FC	1						1
Atherix sp.	PR	4						4
Chelifera sp.	PR	6		1	1	2		1
Hemerodromia sp.	PR	6	3					
Scathophagidae ?	SH	6					1	
TOTALS			97	103	103	91	94	96
HBI			4.67	4.92	4.84	3.86	4.64	3.55
RICHNESS			30	32	35	33	27	32
EPT			9	10	11	15	9	17
EPT/CHIRONOMIDAE			0.69	0.47	0.82	1.64	0.94	11.17
SC/FC			1.95	0.50	0.53	0.41	1.76	0.27
FC/TOTAL			0.21	0.35	0.33	0.19	0.18	0.16
%DOM			25%	11%	10%	10%	24%	11%
NYSPMA			63	63	68	67	66	74
% similarity			12	13	14	32	16	R

Table B2. These results are from DWM's 1997 benthos sampling in the Hoosic River and two of its tributaries, all within Massachusetts. Station HR02 and HR03 bracketed (downstream and upstream, respectively) the Hoosac Valley Water Quality District effluent discharge, Williamstown; and HR07D and HR07U bracketed (downstream and upstream, respectively) the Adams Wastewater Treatment plant effluent discharge. Station PB00 was located on Peck's Brook, Adams, upstream from the power line crossing; and BB00 was located on Bassett Brook, Cheshire, upstream from the gas pipeline crossing. The results from the East Branch Green River (GE01) are provided for reference. The columns labeled FFG and TOLVAL show the functional group and tolerance value, respectively, designated for each taxon, as used in the analyses.

TAXON/**METRIC**	FFG	TOLVAL	GE01	HR02	HR03	HR07D	HR07U	PB00	BB00
Lumbricina	GC	8					1		
Enchytraeidae	GC	10						1	
Tubificidae immature w/o capilliform chaetae	GC	10		1					
Nais alpina	GC	8	1						
Nais communis	GC	8	1			1			
Lumbriculus sp.	GC	5		5	5			2	
Eclipidrilus sp.	GC	5				1			
Hydracarina	PR	6	2	2	2	4	6		1
Baetidae	GC	6	4				1		
Baetidae undet. 1 (cerci only)	GC	6	4				3		
Baetidae undet. 3 (subeq. term.)	GC	6				1	5		
Acentrella sp.	GC	4			1	1			
Baetis sp.	GC	6		4					6
Baetis sp. 2 (short term.)	GC	6	9					16	
Baetis sp. 3 (subeq. term.)	GC	6	11		9			11	
Isonychia sp.	GC	2		1					
Heptageniidae	SC	3			1				1
Epeorus (Iron) sp.	SC	0	3						
Stenonema sp.	SC	3		3		21	9	4	
Attenella sp.	GC	1						7	
Drunella cornutella	GC	0	7						
Serratella sp.	GC	2			1				
Leptophlebiidae	GC	4	2						1
Pteronarcys sp.	SH	0	3					1	1
Tallaperla sp.	SH	0	2					2	
Nemouridae	SH	2	2						
Leuctridae/Capniidae	SH	2							1
Leuctra sp.	SH	0	3					4	
Paragnetina sp.	PR	1			1				
Diura sp.	PR	2	1						
Isogenoides sp.	PR	0							2
Sweltsa sp.	PR	0	7					9	5
Sialis sp.	PR	4	1						
Chimarra sp.	FC	4		2	3				
Dolophilodes sp.	FC	0	3						4
Psychomyia sp.	GC	2		2	4	4	7		
Polycentropodidae	FC	6	1						
Polycentropus sp.	PR	6							1
Hydropsychidae	FC	5			1				

TAXON/**METRIC**	FFG	TOLVAL	GE01	HR02	HR03	HR07D	HR07U	PB00	BB00
Cheumatopsyche sp.	FC	5	3	4	5				
Hydropsyche morosa gr.	FC	6	1	24	8	26	18		5
Rhyacophila sp.	PR	1					1	7	
Rhyacophila cardina gr.	PR	1							1
Rhyacophila fuscula gr.	PR	1							1
Glossosomatidae	SC	1		1					
Glossosoma sp.	SC	0						1	
Protoptila sp.	SC	1			1		2		
Leucotrichia sp.	SC	6		1	1				
Lepidostoma sp.	SH	1	1						3
Goera sp.	SC	3						1	
Ectopria sp.	SC	5	1						
Psephenus herricki	SC	4				1	5		
Optioservus sp.	SC	4		17	19	3	21	6	4
Optioservus ovalis (A)	SC	4				2	1		
Optioservus trivittatus (A)	SC	4			6	1	1		
Oulimnius latiusculus	SC	2				2		8	
Promoresia sp.	SC	2						1	
Stenelmis sp.	SC	5		6			2		
Stenelmis bicarinata (A)	SC	5		1					
Antocha sp.	GC	3		2	8	2	2		
Dicranota sp.	PR	3	2						
Hexatoma sp.	PR	2	1					1	1
Bezzia/Palpomyia sp.	PR	6	2					1	
Prosimulium sp.	FC	2				1			
Simulium sp.	FC	5						5	3
Simulium tuberosum complex	FC	4	6						
Chironomidae	GC	6						1	
Conchapelopia sp.	PR	6			1	2	1		
Nilotanypus sp.	PR	6					1		
Thienemannimyia sp.	PR	6		1					
Diamesa sp.	GC	5		1					
Pagastia sp.	GC	1					4		1
Potthastia gaedii gr.	GC	2		1	1	3			
Orthocladiinae	GC	5						1	1
Brillia sp.	SH	5							1
Cardiocladius sp.	PR	5		1	1	1		1	
Cardiocladius albiplumus	PR	5			1				
Corynoneura sp.	GC	4							1
Cricotopus/Orthocladius sp.	GC	7		1	1				
Cricotopus sp.	GC	7		1	4	1			
Cricotopus bicinctus	GC	7				1			
Cricotopus tremulus gr.	SH	7		3	2	1			
Cricotopus trifascia gr.	SH	6			1	1	1		
Eukiefferiella sp.	GC	6					1		1
Heterotrissocladius sp.	GC	4							1
Nanocladius parvulus gr.	GC	7			1				

TAXON/**METRIC**	FFG	TOLVAL	GE01	HR02	HR03	HR07D	HR07U	PB00	BB00
Orthocladius sp.	GC	6		3	2				
Parametriocnemus sp.	GC	5	3					5	11
Parorthocladius sp.	GC	5						1	
Rheocricotopus sp.	GC	6							3
Tvetenia sp. (P)	GC	5				1			
Tvetenia vitracies gr.	GC	5		2	3	1			
Microtendipes sp.	FC	5				1			
Phaenopsectra sp.	SC	7		1					
Polypedilum aviceps	SH	4	1			6	2		33
Polypedilum convictum	SH	6				1			2
Cladotanytarsus sp.	FC	5					1		
Micropsectra/Tanytarsus sp.	FC	7				1			
Micropsectra sp.	GC	7		1	2		2		
Rheotanytarsus exiguus gr.	FC	6					2		
Sublettea coffmani	FC	4		8	2	1	2		
Tanytarsus sp.	FC	6		1					4
Zavrelia/Stempellinella sp.	GC	4	2						
Dixa sp.	FC	1	1						
Atherix sp.	PR	4	4			1	1		
Empididae	PR	6					1		
Chelifera sp.	PR	6	1						
Hemerodromia sp.	PR	6		1	2	4	3		
Oreogeton ? sp.	PR	6						2	
TOTALS			96	102	100	98	107	99	100
HBI			3.55	4.60	4.71	4.57	4.14	3.47	3.81
RICHNESS			32	28	26	28	26	23	27
EPT			17	9	11	5	7	11	13
EPT/CHIRONOMIDAE			11.17	1.68	1.64	2.41	2.71	7.00	0.54
SC/FC			0.27	0.77	1.47	1.00	1.78	4.20	0.31
FC/TOTAL			0.16	0.38	0.19	0.31	0.21	0.05	0.16
%DOM			11%	24%	19%	27%	20%	16%	33%
NYSPMA			74	58	68	75	64	84	52
% similarity			R	10	15	7	9	38	26
% similarity (paired brackets)				57	R-HR02-3	52	R-HR07		

Table B3. These results are from 1997 Kinderhook Creek benthos sampling. Two reaches were sampled in Hancock, MA bracketing the point on the creek where Jiminy Peak withdraws water. KC01 was upstream from the withdrawal point, between Brodie Mountain Road and Bentley Brook. KC02 was about 250 m downstream from Bentley Brook and the water withdrawal site. The results from the East Branch Green River (GE01)—in the Hoosic River drainage—are provided for reference. The columns labeled FFG and TOLVAL show the functional group and tolerance value, respectively, designated for each taxon, as used in the analyses.

TAXON/**METRIC**	FFG	TOLVAL	GE01	KC01	KC02
Nais alpina	GC	8	1		1
Nais communis	GC	8	1		
Hydracarina	PR	6	2		3
Baetidae	GC	6	4	3	3
Baetidae undet. 1 (cerci only)	GC	6	4	5	5
Baetidae undet. 2 (short term.)	GC	6		4	9
Baetidae undet. 3 (subeq. term.)	GC	6		6	16
Baetis sp. 2 (short term.)	GC	6	9		
Baetis sp. 3 (subeq. term.)	GC	6	11		
Epeorus (Iron) sp.	SC	0	3		
Drunella cornutella	GC	0	7		
Leptophlebiidae	GC	4	2		
Pteronarcys sp.	SH	0	3		
Tallaperla sp.	SH	0	2		
Nemouridae	SH	2	2		
Leuctra sp.	SH	0	3	3	2
Diura sp.	PR	2	1	1	
Haploperla brevis	PR	1		1	1
Sweltsa sp.	PR	0	7		
Sialis sp.	PR	4	1		
Dolophilodes sp.	FC	0	3	1	
Polycentropodidae	FC	6	1		
Cheumatopsyche sp.	FC	5	3		1
Hydropsyche morosa gr.	FC	6	1		2
Rhyacophila sp.	PR	1		1	
Rhyacophila fuscula gr.	PR	1			1
Brachycentrus sp.	FC	1		14	19
Lepidostoma sp.	SH	1	1		
Ectopria sp.	SC	5	1		
Elmidae	SC	5		1	
Antocha sp.	GC	3		2	1
Dicranota sp.	PR	3	2		
Hexatoma sp.	PR	2	1	1	3
Bezzia/Palpomyia sp.	PR	6	2		
Simulium tuberosum complex	FC	4	6	6	6
Tanypodinae	PR	7		1	
Diamesa sp.	GC	5		1	
Pagastia sp.	GC	1		2	3
Orthocladiinae	GC	5			1
Corynoneura sp.	GC	4		1	

TAXON/**METRIC**	FFG	TOLVAL	GE01	KC01	KC02
Cricotopus sp.	GC	7			2
Cricotopus bicinctus	GC	7			1
Cricotopus vierriensis	SH	7			1
Eukiefferiella brevicalcar gr.	GC	4		1	
Eukiefferiella devonica gr.	GC	4		1	
Eukiefferiella pseudomontana gr.	GC	8		1	1
Parametriocnemus sp.	GC	5	3	1	2
Tvetenia bavarica gr.	GC	4		5	
Tvetenia vitracies gr.	GC	5			
Chironominae	GC	6		1	
Polypedilum sp.	SH	5		1	
Polypedilum aviceps	SH	4	1	1	3
Tanytarsini	FC	6		1	
Micropsectra sp.	GC	7		30	5
Rheotanytarsus distinctissimus gr.	FC	5			1
Sublettea coffmani	FC	4			2
Tanytarsus sp.	FC	6		1	
Zavrelia/Stempellinella sp.	GC	4	2		
Dixa sp.	FC	1	1		
Atherix sp.	PR	4	4		
Chelifera sp.	PR	6	1		
TOTALS			96	98	95
HBI			3.55	4.68	4.31
RICHNESS			32	25	23
EPT			17	9	9
EPT/CHIRONOMIDAE			11.17	0.80	2.68
SC/FC			0.27	0.04	0.00
FC/TOTAL			0.16	0.23	0.33
% DOM			11%	31%	20%
NYSPMA			74	64	79
% SIMILARITY (PAIRED BRACKETS)			--	R-KC	53

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APPENDIX D - HOOSIC RIVER SUBBASIN FISH TOXICS MONITORING

BACKGROUND INFORMATION

Hoosic River fish (white suckers *Catostomus commersoni*) were first sampled for PCBs as part of an intensive water quality/biological survey of the Hoosic River conducted during the summer of 1985. A total of six locations were sampled within the river. In addition, golden shiners *Notemigonus crysoleucas*, and brown bullhead *Ictalurus nebulosus* were sampled from Cheshire Reservoir.

Results of the 1985 fish work indicated that although PCBs were detected in seven of the twelve samples analyzed, concentrations were very low in all but two samples. PCB concentrations of 0.84 and 1.28 mg/Kg (ppm) were detected in two composite samples from the Hoosic River mainstem in North Adams downstream from the Sprague Electric Company (SEC). Although a concern, the concentrations were still well below the USFDA's Action Level for PCBs (2.0 ppm).

In an effort to sample additional stations downstream of SEC as well as to sample species, which were more desirable by sportsfishermen and women, DEP re-sampled the Hoosic River during the summer of 1986. Seven stations were sampled, five of which were located downstream of SEC. Analytical variables included selected metals in addition to PCBs. Although the goal of sampling downstream of SEC was met, we collected only one trout from these stations.

PCBs were detected in most samples analyzed, however, were highest in brown trout. Concentrations in brown trout *Salmo trutta* ranged from 0.35 to 30.6 mg/Kg. The only sample, which exceeded the USFDA Action Level, was the one brown trout captured downstream of SEC.

In 1988, DEP with assistance from the United States Department of Fish, Wildlife and Environmental Law Enforcement, Massachusetts Division (DFWELE) again attempted to catch brown trout from the mainstem of the Hoosic River below North Adams. DEP and DFWELE were successful in capturing four brown trout from two locations. In addition, Al Les and members of Trout Unlimited collected additional brown trout using rod and reel fishing techniques. All fish came from the mainstem Hoosic River downstream of SEC. A total of 13 brown trout were collected and analyzed. PCB concentrations ranged from 1.16 – 19.4 mg/Kg and averaged 7.8 mg/Kg. In light of the extremely elevated levels of PCBs the Massachusetts Department of Public Health (MDPH) issued a fish consumption advisory which recommended:

"1. People should refrain from eating brown trout from the Hoosic River caught below the channelized section in North Adams. 2. Consumption of all other fish species from the Hoosic River and its tributaries should be limited to two meals per month per person. 3. Pregnant women and nursing mothers should not eat fish from the Hoosic River and its tributaries in order to prevent exposure of developing fetuses and infants to PCBs."

In light of the fish consumption advisory issued in 1989, the Green River, Hemlock Brook, Broad Brook and Tophet Brook (all tributaries too the Hoosic River) were sampled for metals and PCBs during late summer of 1989. Brook trout *Salvelinus fontinalis*, and/or brown trout were collected from each of these streams and analyzed individually. PCB concentrations ranged from below detection to 2.1 mg/Kg. Only one of twenty-four fish exceeded the USFDA Action Level of 2.0 mg/Kg. In fact, only one fish exceeded 1.0 mg/Kg.

In 1994, as a result of changes in the MDPH PCB advisory issuing criteria and "trigger level" (MDPH established a new trigger level of 1.0 mg/Kg), as well as the consideration of data from 4 major Hoosic River tributaries, the fish consumption advisory was updated and now recommends that "People should refrain from eating all fish from the Hoosic River caught below the channelized section in North Adams".

In an attempt to re-confirm the presence of high PCBs in the Hoosic River downstream of SEC, in 1997 DEP sampled three stations (two upstream of SEC on the North Branch Hoosic River and one downstream of the SEC on the Hoosic River mainstem. Brown trout, brook trout, rainbow trout *Oncorhynchus mykiss*, and longnose suckers *Catostomus catostomus*, composites and individuals were

analyzed for PCBs, organochlorine pesticides, and selected metals. PCBs in fish samples (n=4) from below SEC ranged from 1.1 to 1.4 mg/Kg. PCBs were below detection in all samples (n=8) from the North Branch of the Hoosic River upstream of SEC.

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